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Facts and Figures

Unjustifiable Reticence

FROM time to time we are asked by readers to give them figures relating to a particular aspect of electricity supply or electrical manufacture and too often we have to reply that such figures do not exist owing to the difficulty or impossibility of obtaining information of this kind.

It is common knowledge that a questionnaire relating to any particular subject is likely to elicit replies from about half of those to whom it is sent and many of these replies are qualified in some way. Consequently to produce anything in the way of results means filling in huge gaps which can only be done by calculations based on slender foundations or by more or less shrewd guesses—euphemistically termed "estimates."

The Electricity Commissioners, having powers to call for returns, are fortunate in this respect, and are able to give complete and accurate figures relating to the supply side of the industry, although even in their case there are delays in obtaining information. But on the "utilisation" side concrete and complete information is lacking.

E.D.A. Experience

It would be thought that the Electrical Development Association, representing the great majority of supply undertakings, would be favourably placed to secure all kinds of useful statistics. Until fairly recently, however, the Association found it hard to obtain replies from more than about 40 per cent. of its members regarding the number of cookers and water heaters on their systems. We are told that there has recently been a great improvement.

In other directions E.D.A. finds a lack of statistics. For instance, in the recent discussion on Mr. Swale's paper on industrial power sales Mr. de Nordwall, the Association's power development officer, drew attention to the difficulty of getting hold of facts regarding works installations.

In some respects we have actually gone backward. Thus, the 1935 Census of Production omitted the sections dealing with power plant—a valuable feature of earlier returns.

The reluctance on the part of some supply authorities to divulge information cannot be understood. What have undertakings to lose by stating how many cookers, fires or water-heaters are connected to their systems—if they know? Parenthetically it may be remarked that so far as the smaller domestic appliances are concerned supply engineers themselves are largely in the dark owing to the lack of any regular local "census" of apparatus.

Some supply engineers may question the necessity or desirability of going out of their way to help other branches of the industry, but that is to adopt a very narrow view.

It may be that those who receive questionnaires regard them merely as the production of time-wasting busy-bodies who wish to publish a lot of impressive statistics for statistics' sake. This leads us to consider the purposes served by such inquiries.

Let us take figures relating to the numbers of appliances in use. If we can discover, for instance, the total number of cookers in the country and relate it to the total number of domestic consumers we can obtain the average number of cookers per hundred consumers. Any undertaking which failed to reach this average should then be impelled to discover the reasons. There may be quite genuine ones, but on the other hand there may be merely excuses. This method applied to all the other possible appliances could give a tremendous impetus to development.

It is well known that the publication by the Commissioners of the annual fuel consumption returns showing the stations in each group with the lowest fuel consumption and the highest thermal efficiency has led to a healthy rivalry which has no doubt helped to improve generation standards.

Guide to Planning

Complete and reliable information would benefit the supply industry and also be of considerable value to manufacturers and suppliers of appliances in planning their programmes—particularly if the "saturation" (to use a horrible but useful word) in particular areas could be indicated.

There are many other directions in which such information would be very useful. We hesitate to suggest yet another organisation in the industry but there certainly seems to be a case for setting up a special statistical bureau empowered to gather particulars of all aspects of electrical development.

The Americans seem to be well ahead of us in this matter. Both manufacturers and utility corporations realise the value to the industry and to themselves, of a complete knowledge of the facts.

Polish Electrification

Recent events have brought Poland, a country of which little is known to the British public generally, into greater prominence. It is a country whose development was retarded by war for some years after its rebirth and it is only comparatively recently that serious steps towards its industrialisation have been possible. In this issue Mr. J. Podoski, A.M.I.E.E., a Warsaw engineer, refers to what is being done to expand the use of electricity. He shows that in twenty years the installed power plant and the consumption per head have almost trebled. At the same time Polish production of electrical equipment has risen very considerably, with a depressing effect upon imports. Since 1934, however, electrical imports have been on the up grade, but Germany has been the principal beneficiary, supplying five or six times the amount from Great Britain. The author shows that there is scope for foreign capital and equipment. The general policy is to award large electrification contracts on an all-in basis; for ordinary supplies quotas are fixed.

A Serious Threat

The radio industry had every reason to be perturbed at the Post Office proposal to enter the radio relay business. Appreciable inroads had already been made by the existing relay concerns but this new development might have proved a fatal blow. An assurance has now been given that the Post Office will be content to do the transmission, leaving the radio industry to supply the necessary reproducing equipment. The Postmaster-General considered that the expedition of the service was essential in the interest of national defence and safety. It is even more essential to maintain in existence manufacturers to whom the services look for an ever-growing supply of apparatus for naval and military purposes.

Varying Values

It needs the wisdom of a Solomon to be an arbitrator in electricity supply transfers. Recently parts of the undertakings of the Yorkshire Electric Power Co. and its associate, Electrical Distribution of Yorkshire, Ltd., were taken over by the Rotherham Corporation. The amount offered to the companies by the Corporation was not very generous, for Mr. W. P. Spens, K.C., the arbitrator, awarded a sum about two and a half times that amount. Conversely, the companies placed a rather higher value upon their properties, for the arbitrator's award represented only about three-fifths of the amount claimed. Still we think that the honours go to the companies.

Industrial Tariffs

In an article in this issue, Mr. J. G. Craven mentions a cause of irritation as well as of often unnecessary expense to power users, *i.e.*, the existence of two separate rates for power and lighting. Only just recently we heard of an instance (not at all the worst of its kind) in which a separate lighting tariff would have entailed the duplication of the circuit breakers and about 160 yd. of cable, had not the use of one cable with sub-metering been permitted as a concession, but only after much discussion. Where a maximum-demand tariff is in force, it appears quite unnecessary to make a distinction. Some years ago the electrical engineer of a large municipal undertaking told us that he had adopted a single tariff for power and lighting as a result of representations by power consumers. The result was an increase in revenue to the undertaking, since the average price for lighting on the maximum-demand tariff was more than it had been on a separate tariff. Owing to the greater convenience of combined metering, however, and (in the case of new works or extensions) the avoidance of waste of material, the consumers were more than compensated for the slight increase in cost of electricity.

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Overhead Conductor Fatigue

Liability to failure at points adjacent to or inside clamps considerably depreciates the value of the fatigue strength of conductors on overhead line systems. A particularly interesting feature of the E.R.A. Report presented before the I.E.E. Transmission Section this week by Messrs. E. W. W. Double and W. D. Tuck was the account of the Preiswerk "non-vibrating" conductor in which an aluminium sheath and steel core are tensioned separately, the two metals vibrating on a different harmonic. The effect is that vibrations induced in the sheath by a given wind velocity and eddy frequency are damped out by the core. This seems a promising enough development for field experiment in Great Britain, and the Electricity Commissioners might be asked to state the conditions under which the considerable reduction required in the diameter of the core would be permissible in this country.

I.E.E. and National Service

Members of the Institution of Electrical Engineers will very soon be receiving a questionnaire in triplicate with very full instructions to enable them to offer their services professionally in the event of a state of national emergency. The manner in which they are invited to include their names in the Central Register of the Ministry of Labour is outlined on another page of this issue, and it is important to remember that circumstances may alter the relative importance of work which members may now be doing, or intend to do later on. Members of all classes should not therefore be deterred from completing the necessary forms, the red card in particular, since the data asked for may well prove to be of vital co-ordinating value to the industry, quite apart from voluntary national service. It will permit selection to be carried out with the minimum of interference and proper regard for relative priority of services to be rendered. It is hoped that the I.E.E. returns may be made as soon and as complete as possible.

Manchester-Sheffield Railway

As a result of electrifying the line over the Pennines, the L.N.E.R. expects, *The Times* states, to increase its capacity by 25 per cent. and to recoup the £2,500,000 spent on the work. The advantage will be particularly noticed in the ¾-mile long Woodhead twin tunnel. At present, smoke limits the number of trains that can pass through it, and the only alternative to electrification was the costly one of driving a new tunnel. Recently the coal trade has been using the railway more and a return to normal trade, it is said, would at once exhaust the time-table possibilities of the tunnel. Another benefit is that 88 electric locomotives will take the place of 181 steam engines. A further point for electrification is that it should be possible to maintain the clean-looking appearance of the renovated Sheffield station—a minor point, perhaps, but not without its bearing upon the desire of the railway companies to retain their passenger traffic.

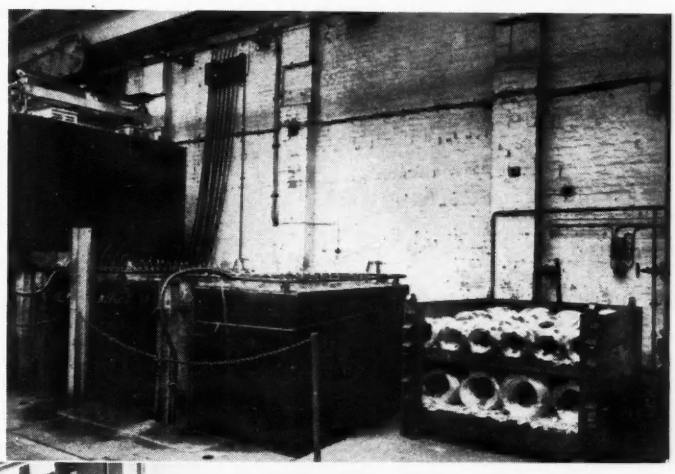
CABLE MANUFACTURE

Expansion and Developments at Prescot and Helsby

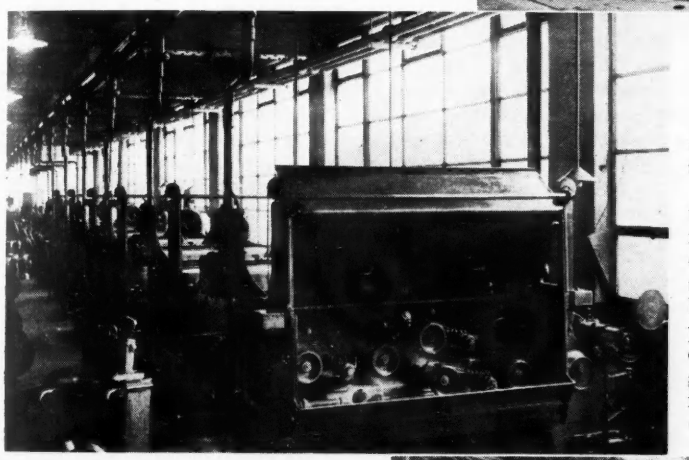
LOOKING back over a number of years one can visualise expansion activities at the Prescot and Helsby works of British Insulated Cables, Ltd., as a normal state of affairs, the extensions being carried out continually and to a definite plan, and so organised on a gradual-growth basis and coupled with improvements to existing plant that at any one time the visitor finds it difficult to draw a line between what is new and old.

Short of writing a complete description of each works then, with much unnecessary reiteration, we propose, as a result of recent visits to the two works, to deal with each as a survey of the later developments seen since our last visit.

To take the Prescot works first and to deal with the different sections of the works roughly in the order of process, we saw considerable alterations going on in the rolling mills. One of the copper-rod mills is at present being altered and larger roughing rolls to take heavier trolley bars have been put down. The intermediate rolls are being altered to suit. In connection with new strip rolling plant, we were told that the speeds of strip production have been increased by 60 per cent. during the past few months. When the strict watch on quality of production is considered, this increase may be regarded as very large indeed. Several new cold-rolling mills for aluminium sheet vary slightly in size, and the largest will roll sheets up to 6ft. 6in. wide.



Electric annealing furnace at Prescot showing (left) main body of furnace suspended over container, containers being water cooled and (right) a charge ready for the container

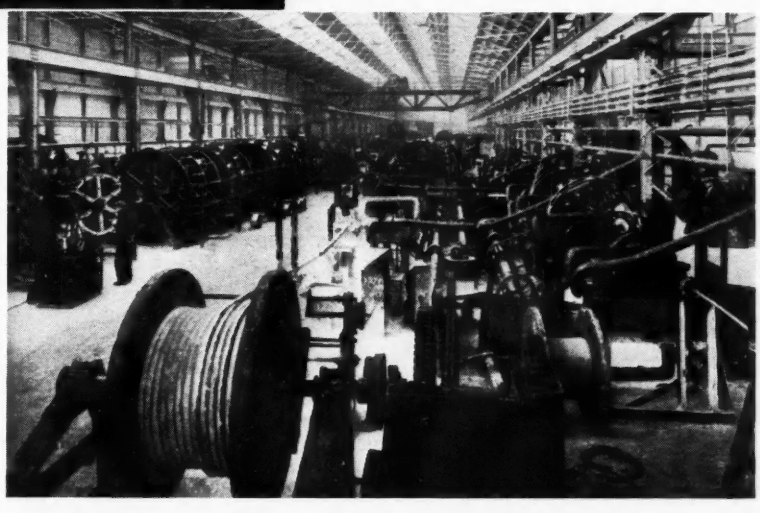


Multiple-die fine-wire drawing machines (Prescot)

Some of the most important, or, at any rate, the most interesting developments have taken place in the wire mill department, where a large amount has been spent on new machinery in the last few years. Continuous wire drawing is a term that has been loosely used for a long time, but in the heavy-wire shop we saw how the really modern idea of running the machine without stops even to remove coils from the delivery end is achieved by means of an exceedingly ingenious arrangement whereby coiling continues on a reservoir block during removal from the final block.

Another important advance which is represented by the newer machines is multi-hole drawing of very heavy wire. We saw heavy wire being drawn through as many as five dies simultaneously; until comparatively recently the limit was one die. Drawing speeds nowadays vary from 1,500 ft. per min. for heavy wire to 5,500 ft. per min. for the lighter wires, representing an advance from about 600 ft. per minute some years ago.

New trolley-wire drawing plant attracts attention to the company's policy with regard to what should be the length of product without a joint. Amongst other considerations, the length is, of course, dictated by the size of the original billet, and the company maintains that beyond a certain weight of metal poured it is impossible to get a homogeneous product from the mould. Tests have indicated that optimum practical results are obtained with a bar weighing about 1,000 lb.



The extended armouring room at the Prescot works

in the case of copper and about 500 lb. for copper-cadmium and bronze. The new trolley-wire plant is of the horizontal spindle type; larger draw-drums will

enable larger diameter contact wire for railway electrification to be drawn without undue flexing. The plant has five dies for simultaneous operation and is driven by a variable-speed motor with push-button control.

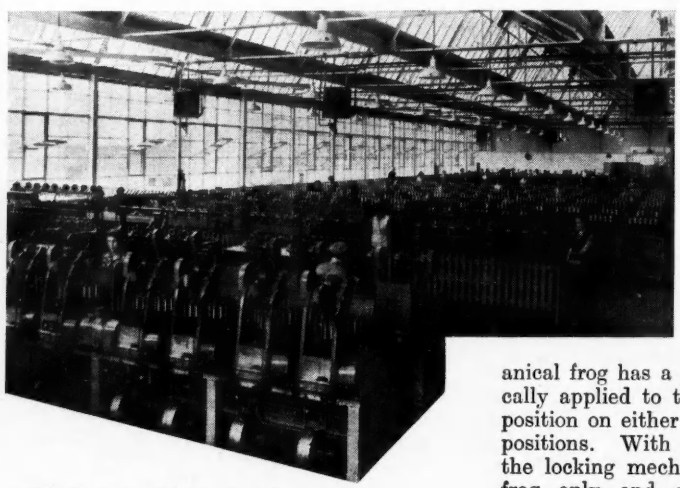
We saw some very fine examples of fine-wire drawing in a new shop in which the machines are capable of producing in all sizes between 0.019 in. and 0.001 in. a total of eight million miles of wire per year. In particular we were impressed by the latest machines which, within an enclosed drawing chamber about 6 ft. long, draw through a series of diamond dies simultaneously, reducing wire from 0.064 in. to 0.0048 in. diameter, at the rate of over 60 miles per hour. The reshaping of worn diamond dies on little machines by means of copper-wire " drills " charged with diamond dust is an interesting process to watch, and so is the drilling of tungsten carbide on the hammer and turn principle.

A new bay in the machine shop of the electrical fittings department at Prescot

In the wire testing shop we saw a new torsion testing machine for dealing with 0.3 sq. in. grooved trolley wire. The motor drive affords a more constant speed than the old hand drive, and as the test piece is part of the motor control circuit, automatic recording is facilitated at the breaking point. Similar machines are also used for smaller wires. Another interesting testing equipment is a Vickers " Pyramid " hardness testing machine.

Bright annealing of copper wire has a definite effect on the finish, and hence the sales of the product, and so the new bright annealing furnace at Prescot must be given pride of place among the latest developments. It has a capacity of four tons of wire. The elements are placed round the inside of the shell of the furnace, which is lifted off and lowered over the water-sealed and inverted wire container in which the coils are packed in racks. The necessary flexible connections to the outer case or furnace proper are arranged by trailing cables.

The charge is heated up in about two or three hours; a fan in each charge base ensures proper heat distribution. An inert gas is used for the " atmosphere," and is generated by a self-contained plant on site. The temperature of the furnace is automatically controlled.



Winding machines in the Helsby silk-covering and tinsel shop

We remember how struck we were some years ago with the huge cable armouring shop, with its three bays and floor area of 520 ft. by 100 ft. The side bays then housed the preparation plant for bedding and serving under and over the armour. This preparation plant is now accommodated in an annexe to the armouring shop, and in the side bays new armouring machines have been installed. The side-bay roofs have also been raised and cranes have been installed, with the result that the shop is even more imposing and is lighter. In the annexe jute yarns and hessian tapes are prepared by plant including vacuum impregnators, drainers and proofing equipment, and armouring wire is wound on to spools ready for the armouring machines.

The electrical fittings department is ever growing, and the old works canteen on the top floor has been converted so that the whole floor area is available for the assembly of trolley-bus and electric railway overhead fittings. A new sand-blasting installation is to be devoted exclusively to overhead fittings. In the big machine shop nearby we saw some very fine examples of individually driven machines, including some four-speed presetting automatic reversing equipments by Alfred Herbert, Ltd. A Lumsden machine grinds the faces of the two halves of street pillar sealing chambers to within a " thou."

We saw several new tramway and trolley-bus line fittings. A single-wire insulated crossing of the dumb-bell type with set-screw ends is designed for insulating two trolley wires of opposite polarity where they cross one another. It has renewable ends, ensures a clean run through with either wheel or shoe collection, and is available as either right- or left-hand equipment and for angles from 25 to 60 deg. in 5 deg. steps.

A new dumb-bell type section insulator has a backbone with two members—one (dumb-bell) in tension and one in compression—both of steel embedded in high-grade insulating material. An arc trap and shield prevent damage from arcing when the head is passing. The body of the fitting can be used as an independent unit for making up crossings, crossovers, and other special trolley-bus fittings. A new double-tongue mechanical frog has a positive lock automatically applied to the tongue in the set position on either the branch or straight positions. With a linked pair of frogs the locking mechanism is fitted on one frog only, and controls the other by means of the connecting rod. The frog is available for use as right- or left-hand or " Y " equipment, and for use with 4/0 standard grooved or " Portsmouth " section wire.

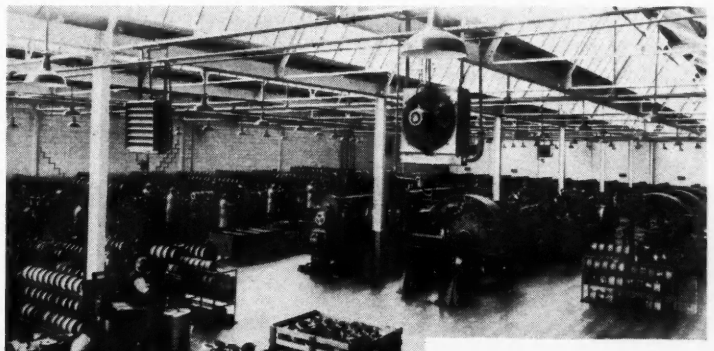
Evidence of the growth of popularity of rising mains for large buildings was found in a number of distribution boxes specially designed for this purpose which we saw. The latest design provides for tapping off the rising mains on each floor of a block of flats, and is intended for use with the company's three- or four-core non-bleeding " sandwich " cable or with three- or four-core varnished cambric or rubber cables. Constructed of cast iron, the boxes can be arranged in a variety of ways. From the central bus-bar chamber

the ends of the bus-bars project, carrying easy-wiring connectors for the uprising mains. On either side of the bus-bar chamber is a ventilated cast-iron fuse box containing bus-bars and s.p. fuse units. The fuse boxes are available with up to four ways each, and the standard fuses are 60A maximum.

Before leaving Prescot we must refer to the manufacture of welders and the more recent development, electrically operated foundry moulding machines, for which a completely new shop has been built at the north boundary of the works. The machinery layout is a very fine one, and we were struck at first by the comparatively small space devoted to fitting work for such rather complicated products. But modern machinery is so accurate that little fitting is required as a rule.

There are some excellent examples of modern boring, planing and drilling machines in the new shop, and we saw an Archdale equipment which will drill up to 4-in. diameter holes at work on housings and pedestals for welding machines.

A recent B.I. development is the making of foundry pattern plates, and we saw some of these with the two halves of the same mould on a common backplate.



A view in the telephone switchboard cable shop at Helsby

The Helsby Works

The principal role of the Helsby works is, of course, the production of rubber-insulated cables. Rubber is received in sheet or crêpe form, and it was surprising to witness the great care exercised in examining the sheets to prevent foreign matter being allowed to remain in the rubber during the subsequent operations.

Drugs for treating the rubber are received on an elevated platform, where they are sieved and chute-delivered to floor level. The all-important precision control of ingredients is obtained by first mixing them with a comparatively small quantity of rubber, so that given quantities of the preliminary mixture can then be supplied for the bulk mixing. After an initial breaking-down the rubber is treated on heavy mixing machines whose rolls travel at different speeds. The bulk of the powders are added at this stage.

A section of the condenser winding plant at Helsby

Slabs of the mixed rubber are reduced to the required thickness for insulating purposes in three-bowl calenders. The bowls are very large and are hollow, and to compensate for slight distortion under the enormous rolling pressure the faces of the pulleys are ground slightly convex. The thin sheets are delivered from the machine rolled up in calico for mechanical protection and to prevent sticking during storage.

When required, the sheets are unrolled and freed from the calico, and the rubber is split in tapes during passage over a line of knife-edge rolls spaced according to the widths of the tapes required. The tapes are re-rolled into much larger rolls than the sheet rolls, the ends of the lengths being joined by simply hammering them together.

At this stage the two process-flow lines—conductor and insulator—meet at the insulating machines. The conductors usually are of stranded or wire-rope form, but sometimes they are single wires. Both methods of insulating—lapping and longitudinal application—are employed. Longitudinal application has the advantages of multiple operation, and we saw machines covering as many as thirty conductors simultaneously with three layers of rubber. At each stage the conductor or partly covered core is fed between the top and bottom rubber strips through a pair of grooved rolls which "weld" the edges together. There is an operative at each feeding head for the rubber. In the case of lapping, the rolls of rubber strip revolve about and unwind on to the central travelling conductor or partly covered core.

Whereas any size of cable can be dealt with readily on the lapping machines, to change the size of cable on a longitudinal machine it is necessary to change the grooved rolls to suit the new size of cable. We actually saw a conductor as large as 0.06 sq. in. being covered on a longitudinal machine. The insulated cores are next taped on high-speed lapping-type machines.

In preparation for vulcanising, which is carried out in a shop rebuilt and re-equipped after a fire three or four years ago, the taped cable is wound on steel drums with a slightly conical centre, which are deposited by a crane in the vulcanising tanks or vessels. Instead of the many hinged bolts around the cover for fixing it in position, these vessels are equipped with an interrupted thread which is operated by a simple hand wheel. One battery of seven of these vessels is centrally controlled from floor level, and the normal operating staff is one man at the central cabinet and one man on the loading platform.

Small drums, or cylinders, are placed and lifted five on a plate—as a cruet—and these are placed in vertical vulcanising cylinders; very large cables are vulcanised in a horizontal cylinder. After vulcanising, some of the cables are tested at 6,000 V on the continuous spark testing principle, the cable passing through a nest of chain electrodes for this purpose.

To revert to the rubber-mixing building, this is where rubber is applied to cables by extrusion, mainly as sheathing for t.r.s. cables. In each extruding machine the hand-fed mixed rubber is received by a pair of rolls which push the material on to a screw which then delivers to the die surrounding the central cable. We saw one very large extruding machine covering a 0.75 sq. in. cable which was to be used for traction work.

The proofing of taping calico and the lacquer finishing of aeroplane-type cables are carried out in a separate building remote from the factory proper on account of fire risk. Plastic rubber mixed with a spirit solvent is spread on the calico, which is then passed through a drying chamber in which the fumes are drawn off. The lacquer is applied in exceedingly thin coats. Cables for lacquering are usually made in lengths of 100 yards, and are paid over a system of pulleys, during which they pass through a lacquer tank which is fitted with rubber snuggers and thence through a drying chamber.

On the cable braiding side the works largely resembles a textile mill. There are a very large store for all manner and colours of cottons, silks, and worsteds, a well-equipped testing station for yarns, a winding room, and, finally, large braiding rooms, one of which accommodates over 1,000 braiding machines.

Assembly and testing section of condenser factory at Helsby

An impressive new building at Helsby is that of the silk covering department. It is a single-storey structure of steel and concrete, two sides being glazed practically from the floor to the eaves. The building is fully equipped for the manufacture of single and double silk-covered wires, Litz wires, and high-frequency cables, and many thousands of miles per week are produced in sizes ranging from 0.001 to 0.036 in.

Tinsel Conductors

It also produces tinsel conductors for telephone cords, etc., the whole processes of which, from the rolling of the metal strips to the spinning of strip round textile threads and the assembly of numbers of such spun threads into specially stranded forms of conductors, calls for the exercise of considerable care. The very thin and narrow tinsel strip is rolled from fine wire.

We saw this metal strip being spun on fine cotton yarn on machines running at very high speeds, but in spite of these high speeds the metal strip is so fine that only a comparatively small weight is produced by each machine each week. Usually twenty-four of these spun tinsel threads, which, as one may guess, are of infinitely flexible structure, are assembled in three bunches, each of eight threads, on special machines for use as conductors in telephone cords. We also saw very high-speed machines applying two layers of silk on fine copper wire.

The new building of the telephone switchboard cable department at the Helsby works is virtually a self-contained and equipped factory for the manufacture primarily of switchboard wires and cables used in the equipment of telephone exchanges, totalisators, etc., push-back wires for radio work and bell wires. The principal materials are silk, cotopa, wool and cotton.

A considerable portion of the product is marketed in the form of single and twin wire, while a large quantity is converted into cable form. For the last purpose such insulated wires are passed through twinning or quadding machines and later through laying-up machines. The final processes are drying under vacuum, impregnating solid with wax, and providing protective coverings, usually in the form of cotton, paper and lead foil, braiding and painting, or covering with a tube of lead or lead alloy.

Condenser Manufacture

The condenser works at Helsby has recently been extended for production increases in the following proportions: electrolytic condensers, 100 per cent.; paper condensers, 50 per cent. The layout of the plant provides for production on a continuous-flow principle, and very briefly the processes are as follows: All paper condensers are made by winding together long strips of very pure thin paper interleaved with metal foil, the units for power-factor correction condensers having corrugated spacing pieces inserted at intervals to assist oil circulation. Mounted in quadrants and placed in trays, the units are dried and vacuum impregnated, and, after cooling and while still immersed in oil in the trays, they are tested at 2,500 V in the case of 660-V condensers and also for power factor.

The power condenser units have capacities of from 1 to 3 μF each. The units are then mounted in racks and finally assembled in the oil-filled tanks. Power condensers are produced in sizes up to 300 kVA weighing over 2 tons each.

Electrolytic condensers for various radio applications and for capacitor-start single-phase motors have been developed on rather special lines; this type of condenser consists of an aluminium foil with the surface so treated that it acts as a dielectric. This treatment of the aluminium foil is accomplished by winding the foil through a bath of electrolyte whilst a current is passed from the foil to the electrolyte in the bath.

I.E.E. Visits

THE Transmission Section of the Institution of Electrical Engineers has arranged a week-end visit to Ireland from May 19th to 23rd. The outward journey will be made on May 19th and on the following day visits will be paid to the Pigeon House power station, Dublin, and the Inchicore outdoor transformer station. The members will be entertained to luncheon at the Gresham Hotel by the Electricity Supply Board. On the Sunday there will be a motor-coach tour through Wicklow and the Dublin Mountains, and in the evening the party will proceed to Belfast. On May 22nd a visit will be paid in the morning to the Rosebank switching and control station of the Electricity Board for Northern Ireland, and following lunch at the Grand Central Hotel the shipbuilding and engineering works of Harland & Wolff, Ltd., will be visited, the company providing tea. From these works members will go to the Harbour power station of the Belfast Corporation Electricity Department, returning to the Grand Central Hotel for dinner. The return jorney will be made after dinner.

The summer visit of the Meter and Instrument Section will take place on May 6th, when a tour of inspection will be made of the G.P.O. Research Station, Dollis Hill, and Windsor Castle. Lunch will be taken at the Brent Bridge Hotel, Hendon, and tea at the Old House Hotel, Windsor.

Full particulars of these visits and forms of application can be obtained from the Institution, Savoy Place, London, W.C.2.

FACTORY INSTALLATIONS

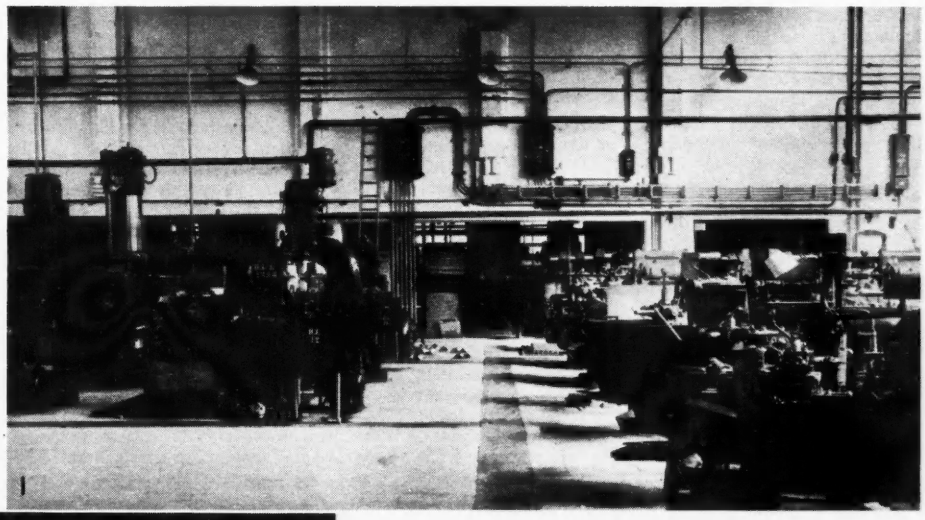
Planned Distribution Layouts

By J. G. Craven, M.I.E.E.

THE need to plan the electrical distribution layout as an integral part of the general factory scheme cannot be over-emphasised, and unless a considerable amount of forethought is brought to bear on this problem an inflexible electrical installation may result, involving waste of materials and labour should extensions to the installation be necessitated later. Collaboration at the outset is essential between the factory or works planning department and those responsible for the electrical installation layout, whether consulting engineers, the company's own electrical staff or independent electrical installation contractors.

The ideal layout in every detail for a power installation in a new factory is very rarely possible in view of the many contingencies that may arise. The amount of reliable and really essential information which will be obtainable at the outset will vary considerably, as complete layout drawings showing the position of all electric power units to be installed are only rarely available, particularly in these days of unit drives.

In regard to lighting, industrialists have today generally recognised the value of a scientifically designed installation. Those who have not realised it for themselves have recently received a spur by way of the new Factory Act which should ensure that no new industrial buildings will be erected in the future with inadequate artificial lighting.



1. Installation where layout was available at the outset. 2. Conduit installation in section of a machine tool shop where a distribution layout was not available at the outset

Where it is recognised from the beginning that a good standard of general lighting is essential to give even illumination over the entire working plane the layout of the lighting installation, comprising main switchgear and fuseboards, submain and sub-circuit fuseboards, switches and lighting points, becomes a simple matter, and once completed is unlikely to call for any expensive alterations or additions.

If complete particulars of electric power requirements and their layout are not available it becomes necessary to consider carefully the details that are settled along with the possibility of future extensions.

Assuming a supply to be available, consideration must be given in the following order to the various sections comprising the complete power installation: (1) Main switchgear. (2) Main distribution cables. (3) Main fuseboards or, with very large installations, sub-main switchboards. (4) Sub-mains and sub-fuseboards. (5) Circuit wiring.

Under heading (1) the choice of the type of main switchgear will largely depend on the size of the installation, and until the recent development of low-voltage high-rupturing fuses, oil-immersed switchgear with automatic protection was strongly advisable where large amounts of power had to be controlled.

There is no doubt that in the future more extensive use will be made of low-voltage fuses of this type on main switchboards in factories. The chief objection to their use for this purpose is that in case of a fault causing a fuse or fuses to blow, the supply cannot be resumed as quickly as with oil-immersed switchgear fitted with automatic protection.

This resolves itself into a question of whether the immediate resumption of supply is of sufficient importance to warrant the extra cost of installing oil-immersed low-voltage switchgear with both overload and time-lag settings, which can be adjusted without interrupting the supply.

As the main switchboard will control the whole of the supply to the factory, its location is of paramount importance if the average length of the outgoing mains is to be kept reasonably low. The position in the switch house of the main switchboard is equally important, as any alterations or additions necessitated by factory extensions after it is once fixed and connected up will prove very costly. In addition, this work will have to be carried out at night or during the week-end when the factory is shut down.

Unnecessary Duplication

Assuming a factory capable of considerable extension requiring an estimated initial supply of 300 kVA at 400 V three-phase for power and lighting, the details of the supply authority's tariff should be considered.

Should a single tariff for both power and lighting supplies not be available, separate lighting and power main switchboards will be necessary to allow for the separate metering. Incidentally, it is scandalous that there should still be supply authorities who have no common tariff for both power and lighting for large industrial consumers, so that completely separate mains have to be run for the two services throughout the factory, which possibly comprises a large number of

widely-spread buildings. The only alternative to this duplication is to sub-meter power and lighting in the various buildings, resulting in a complicated account even if permission can be obtained for this procedure from the supply authority.

If a single-rate tariff is available the advisability of providing separate power and lighting main switchboards will depend upon the disposition of the factory buildings.

To control the incoming main supply a 500-A, triple-pole, oil-immersed, unit-type, industrial-pattern, circuit-breaker fitted with a no-volt and three overload releases with time lags and a bus-bar chamber with four bus-bars could form the basis of a low-voltage main switchboard capable of extension. Three ammeters and a voltmeter with switch and fuses should also be provided.

This triple-pole main switch might be fixed at either the right or left-hand end, or at the centre of the switchboard. The end arrangement is preferable, as if space is left the main switch can be replaced by one of larger capacity, or retained to control a power circuit if a new and larger switch is added. Similar unit type triple-pole circuit breakers, but without the no-volt release, can now be decided upon to control the distribution mains, the capacity and number of which will depend upon the disposition of the power load in the factory.

Should departmental costing be required, metering panels should be incorporated in the main switchboard. The question of providing ammeters on the main circuit panels is a debatable one. If there is likely to be any out of balance due to the use of single-phase appliances or lighting three ammeters should be provided, or none at all.

Main and circuit switch panels should be equipped with suitable cable entries depending on the type of main cable to be installed. The connections from the supply authority's terminals to the main switch will be short in the majority of cases, and v.i.r. single-conductor cables mounted on racks with cleats will provide the most economical and flexible method, although in exceptional cases bare copper bars taped after erection can be used.

For a permanent installation of large capacity (500 A per phase and over) single-core, paper-insulated, lead-covered cables with sealing bells at each end are suitable, but the cable manufacturers' advice should be obtained regarding the installation and bonding of the lead sheathing in order to prevent undue losses and heating of the latter; alternatively reference can be made to Cable Research Handbook, Vol. 2, p. 65, which gives excellent information on the use of large single lead-sheathed cables for connecting up switchgear and transformers.

Single Supply Mains

Should the buildings of the factory be spread out over a fairly large area four-core distribution mains should be adopted to carry both lighting and power. The chief, and usual, objection to the use of a common distribution main in a factory for the two purposes is that in the event of the circuit-breaker tripping, or a main circuit fuse blowing, the supply for both power and lighting is cut off. There are, however, scores of large factories which depend upon a single supply main, and the factor of safety against breakdown of any part of the main distribution system in a factory should, with first-class workmanship and materials, be equal to the supply authority's distribution system.

If both the power and lighting loads are high in a particular building, the size of one main to meet both demands may become excessive, and if two separate mains can be run at the same time it may be found to be less costly. A glance at the tables in the I.E.E. Regulations for v.i.r. and paper-insulated cables will show the falling off in carrying capacity per sq. in. of copper as the size increases.

Choice of the type of main distribution cables in the factory will depend mainly on the length of run and the load to be carried. Four-core cables should invariably be used, as to install three-core cables because the motive power is three-phase is to court trouble sooner or later, and 230-V single-phase should be available at all power distribution points and fuseboards for single-phase appliances.

For loads less than 50 to 60 HP, v.i.r. cables in screwed heavy-gauge conduit are generally used, but for loads exceeding this figure, requiring heavy mains to switch or fuse distribution boards and thence to large motors, or heavy current consuming apparatus, their size and cost become excessive. Four-core, paper-insulated, lead-covered and armoured cables for main and sub-main distribution cables will then be found to cost considerably less, as also will the labour for erecting.

Reference to Tables 5, 6, 10 and 11 in the I.E.E. Regulations will show the advantage as regards cable sizes, and consequently cost of using paper-insulated cables in such cases in lieu of v.i.r. cables in conduit. For short runs, however, the cost of providing suitable sealing boxes and armour clamps at each end, with the additional labour required to trifurcate and seal off with compound, will outweigh the saving in cost. Cable manufacturers will always help to reduce the number of lengths and sizes of cables by advising the most economical combination to order.

Paper-insulated lead-covered single-core armoured left-bright cables can be almost invariably used when erected "in air" for factory work, and presents a neat and clean appearance. Double-wire or tape-armoured and served cables are only necessary in exceptional circumstances, to prevent mechanical damage, and where run underground.

Armoured cables should not be run underground in factory yards without protection but in either earthenware pipes or troughs depending on the length of run, or protected by tiles laid over the cables before filling in the trench.

In the larger sizes "whipping wires" should be provided to prevent barrelling or bird caging at bends. Should it be found essential to leave or enter switchgear or fuseboards vertically from above, and the vertical length is over 15 ft., cables of this type should be "drained" by the manufacturer, otherwise no precautions in the way of hard tropical compound or solder sealing the cores will prevent the oil in the cable percolating through into the switchgear or fuseboard.

The erection and running of this class of cable in modern factory buildings will call for ingenuity in designing "fixings" in the way of cable racks, saddles, "J" hooks and hangers on walls, roof trusses and stanchions. Cable of this type can also be conveniently run for short spans overhead between buildings suspended by hangers to a stranded steel catenary. A much neater run results than by use of four single v.i.r. or aerial insulated cables for a three-phase four-wire system.

Where the power units are 100 HP or less, triple-pole and neutral fuseboards will be suitable for protecting or isolating for repairs the sub-main circuit to the starting gear.

Provision for Extensions

It is of the utmost importance in designing the installation to consider carefully each main circuit switch, distribution main, sub-main switchboard, or main fuseboard in regard to the load to be installed at the outset, the diversity factor of the load and the possibility, or likelihood, of extensions in the area near the sub-main switchboard or main fuseboard. To take the immediate power or lighting load without any margin for extensions or additions as the basis in estimating the sizes of the above is to throttle the installation at the outset.

Should it be obvious that a factory or works is capable of extension, then spare fuseways in distribution fuseboards, backed up sub-mains, mains and main circuit switchgear should be provided of sufficient size to allow for additional load especially in view of the possibility of new applications of electricity.

The placing of fuse distribution boards centrally in order to minimise the average run to power units is nowadays presenting additional difficulties due to the tendency in modern factory construction to eliminate steel stanchions as far as possible, particularly in the aircraft industry. These have in the past provided excellent fixing positions for central distributing points for plugs and sockets for power, and switch positions for lighting.

A Neat Installation

Taking the case of a layout of sixty machine tools with unit drives, the motors being from 1 to 7½ HP, where no stanchions and only one nearby wall are available for the fixing of the fuse distribution boards, fig. 1 shows a main three-pole fuseboard immediately to the right of the ladder. Six galvanised conduits drop vertically into the trench covered by chequer plates.

From the main trench six branch trenches (three at each side) run out at right angles, a ten-way, three-pole sub-fuseboard being mounted on a sheet steel frame. Three-phase circuits are run in galvanised conduit from each of the ways on these sub-fuseboards to the control switches for the motors on the machine tools.

This layout results in a neat and unobtrusive installation with easily accessible fuseboards, and the minimum, and therefore most economical, average length of final sub-circuit. As the area planned out at the outset for the machine tool department was definite, no spare ways on the fuseboards were considered necessary, and the sub-mains were calculated from the total HP per fuseboard allowing a 50 per cent. load factor, which has proved ample.

Fig. 2 shows a conduit installation in a section of a machine tool shop where a distribution layout was not available at the outset. Since the provision of trenches was not practicable the conduits were run from the sides of the building from the sub-fuseboards *via* the roof trusses and vertically downwards some 18 ft. to the motor controls fixed on the machine tools.

This method of distribution results in long final sub-circuits, and for a large number of unit drives adds considerably to the installation costs. In addition, a multiplicity of vertical

conduits does not result in a pleasing installation, however neatly carried out.

The number of ways on the sub-main fuseboards in this case was decided by the area available for machine tools, and the number likely to be installed. The sizes of the three-phase sub-mains were calculated on the assumption of an average of 3 HP per fuseway.

Special Cable

The use of compound insulated multi-core cables of the "ite" class has been considerably developed in mining work. I understand that this class of cable can be run at a current density and temperature approaching those for paper-insulated cables in mining work, where the I.E.E. Regulations do not apply.

No figures appear to be available for the ratings of this cable, which does not require compound sealing. If it could be used for industrial work where the I.E.E. Regulations apply, it would appear that the tables for v.i.r. cables would have to be adopted, which rules it out for general use on account of size and cost.

I have, however, been concerned with an extensive 400/230-V, three-phase power and lighting installation in a textile factory carried out to the specification of a consulting engineer, and specifying this cable, multi-core armoured without lead sheath, and ratings for paper-insulated cables were used for estimating; voltage drop being taken into account for long mains.

The I.E.E. Regulations (Tenth Edition) do not recognise this cable for the use in buildings (see rule 1307) but one may hope that tables for the rating of this class of cable will be included in the next edition.

Probably sufficient research has not yet been made with regard to its use as an alternative to paper insulated cable in buildings, but its advantages will be obvious to installation engineers.

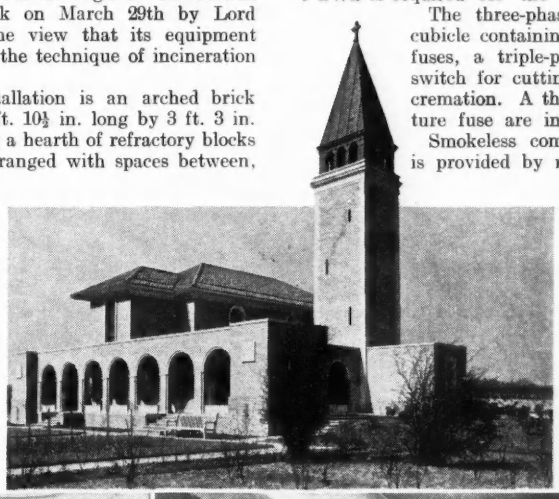
ELECTRIC CREMATORIUM

Improved Incineration System

AN electric crematorium for the Borough of Camberwell was opened at Honor Oak on March 29th by Lord Horder, who expressed the view that its equipment represented the highest point in the technique of incineration in the world.

The main feature of the installation is an arched brick steel-encased electric furnace, 7 ft. 10½ in. long by 3 ft. 3 in. wide by 2 ft. 11½ in. high, having a hearth of refractory blocks running across its width and arranged with spaces between, through which the ashes fall to a nickel-chromium collecting plate.

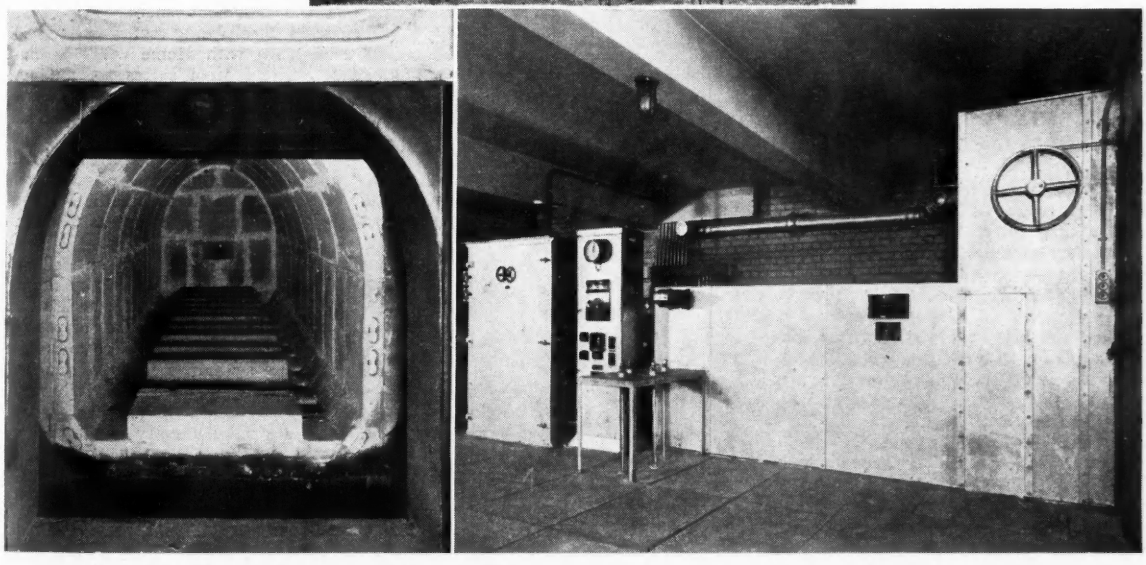
At the front end is a vertical-lift door operated by a hydraulic ram. Tubular heating elements in the refractory lining are arranged in two 30-kW banks, each balanced across a three-phase supply. Full heat is required only for the preliminary heating of the chamber and during cremation only one bank of elements is left in circuit, although it is rarely required then. The latter is automatically switched by a Cambridge direct deflectional controller, equipped with push-button switch, pilot lamps and fuses and a time switch to operate once daily.



Air is introduced into the combustion chamber through openings in the side walls and combustion gases are drawn off through the walls below the hearth and led to a heat recuperator for pre-heating the incoming air. Two small fans with direct-on started motors provide the draught. The energy required for pre-heating the furnace depends upon the length of time since the previous service and during cremation up to 5 kWh is required for the blower motors and auxiliaries.

The three-phase supply is controlled from a cubicle containing a triple-pole main switch and fuses, a triple-pole contactor and an auxiliary switch for cutting out half the elements during cremation. A thermo-couple and excess temperature fuse are installed to protect the elements.

Smokeless combustion, as far as practicable, is provided by means of a photo-electric equipment, which indicates the atmospheric conditions inside the furnace chamber and its flues, and any smoke finding its way to the chimney can be reduced by operating the air-flow controls. This equipment consists essentially of a projector unit, a receiving unit with a photo-cell and a 6-in. indicator on the Ringlemann smoke-density scale mounted on the furnace casing above the flue-control desk.



The Honor Oak crematorium, with views of the inside and outside of the electric furnace

The coffin is lowered from the chapel into the commitment chamber by a hydraulic lift, on the ram head of which is mounted the bronze catafalque platform. This lift is controlled by a lever in the commitment chamber, where a 3-cwt. crane transfers the coffin to the charging machine.

The furnace installation is of the G.E.C.-Brown Boveri type and was designed by the General Electric Co., Ltd., and manufactured at its Fraser & Chalmers works. The handling equipment was made by the Express-S.M.S. Lift Co., Ltd., The building was designed by Mr. W. Bell, borough engineer and surveyor, and the consulting architect, Mr. M. E. Webb.

A.R.P. AT POWER STATIONS

Minimising the Special Risks

By E. McCarthy

PROTECTING buildings against air raids is a commonsence undertaking, and each building has particular features that require special attention to which the regulations and suggestions issued by the Home Office may not apply. The usual consoling A.R.P. lecturer who states that, in large towns, buildings are in proportion to open spaces as 1 is to 5, thus making the chances of a direct hit very small, is obviously not referring to the protection of power houses. These buildings would become military objectives set, possibly, alongside a large river which would act like an arrow pointing towards the bull's eye.

Keeping the reasoning on simple lines, if, say, Battersea power station becomes a military objective, the onus is theoretically upon the military authorities to provide the necessary protection. The army is essentially a military machine, however, and in a war would be fully occupied, so that the defence of power stations would probably be relegated to the Territorial Army.

Anti-aircraft Gun Stations

The tactics adopted would be to force the attacking aircraft to fly so high over the power station that it could not score a direct hit. This would involve the location of anti-aircraft gun stations fairly high up; for example, on the roofs of buildings in the vicinity. The army is used to concrete gun emplacements on the ground, and is not conversant with such measures as linking the steel frame of buildings across large internally lighted areas so that the structure will be sufficiently strong to support one or more quick-firing guns.

This is where the layman can be useful, for he can suggest to the authorities suitable roofs which should allow a fairly clear view all round, the actual gun positions being directly over stanchions so that the weight of any one gun can be directly distributed between four stanchions. Lift heads and roof tank rooms, although giving additional height, are actually of no value and should be demolished before fixing a gun, because roof buildings are rarely steel-framed and the firing of an anti-aircraft gun placed on a lift head or tank room would probably shatter the brick structure.

Having indicated the limit to which military protection of our large power houses against air raids would be given, I can now deal with the protective measures to be taken in the power house itself. The danger of accurate bombing having been put in the background, chance hits must not be overlooked.

Protection Against Bombs

The types of bombs which were expected during the last emergency were gas, medium-sized explosive, armour-piercing, and incendiary bombs. The medium weight bomb would be sufficient to penetrate three floors of a modern steel-framed building and partially wreck the upper part of the structure. The result would not be so drastic as might appear at first, for the explosion of a bomb in or by a steel-framed building does not cause the fabric to collapse, but only buckles that portion of the framework directly involved. All plant and mains should be protected wherever possible by sandbags to prevent damage by flying splinters, and all essential machinery parts should, where possible, be duplicated and stored ready for use. Continuity of repair staff should be arranged, and the power station should be entirely independent of outside aid.

As power houses will become military objectives, the bombs reserved for attack might be of the armour-piercing variety which are of great value for breaking up fortifications. For this reason I do not suggest expenditure on roof protection against explosive bombs. If a direct hit occurs all one can do is to hope that the sandbag barricades around the machinery will minimise the damage due to splinters.

Undoubtedly the most serious damage can be done by releasing showers of incendiary bombs over power houses, in batches of twenty. One aeroplane can carry a load of two thousand, so that if one aeroplane only of an invading air armada were successful in getting through the outer defences it could do considerable damage before being brought down by the anti-aircraft battery.

Protection against these bombs is comparatively simple as they are quite light and are nothing more than big fireworks. The component parts are a core of oxide of iron and powdered aluminium with an outer casing of magnesium. The local fire brigade will willingly arrange a demonstration showing the simple methods of dealing with these missiles.

I do suggest, however, placing a layer of sandbags over the flat roofs to stop incendiary bombs from burning their way through to the machinery. Where roofs are on the slope, sandbagging can often be arranged on boards placed on brackets carried upon additional spanning steel joists. In every case the capacity of the structure to take these additional weights must be a first consideration. Simple protection to skylights can be made with steel sheets ¼ in. thick, and window protection should be provided to prevent incendiary bombs bouncing off any adjoining roofs and into the main building.

Having dealt with the actual protection of the structure except from direct hits by explosive bombs, many of which have delayed action fuses and could only be stopped by a reinforced concrete raft many feet thick, and with the protective covering against incendiary bombs, I now suggest the measures to be taken by the staff and for the actual protection of the staff.

The controller during a raid should have a small room at least 30 ft. up and with a view over as much of the buildings as possible. He would be able to direct the fire-fighting squad in the event of an outbreak of fire, and would be connected by telephone to the patrol squad and the air-raid shelter. It would be the duty of the controller to direct, during an emergency, the evacuation of any part of the building or the refuge. He would also be in direct touch with the staff first-aid post.

Refuge for Staff

For the protection of the staff a gas-proof refuge should be provided, and this could possibly be provided in an existing basement room, provided the room to be converted is not directly under heavy machinery or below the level of an adjoining river or canal and therefore liable to flooding. The danger of flooding from a fractured hydraulic lift main is not very serious where near a large basement, as the first high-pressure burst would not be maintained.

The existing ceiling of the basement shelter should be strengthened to take the strain of collapsing roof or floors, and rendered gas-proof in accordance with Home Office recommendations and provided with gas-proof access lobbies. A second escape should be provided in case the main access stair became blocked, but this secondary escape can be as small as 2 ft. 6in. square.

Without artificial ventilation, each person requires a total of 75 sq. ft. of floor, wall and ceiling area for a stay of six hours. After that time the air would still be fit to breath, but the temperature would rise sharply to such an extent as to make the stay unbearable.

With forced ventilation two ducts should be taken well up the building and protected against damage by flying splinters. If one became damaged, then the other would still be left for use. Forced air ventilation allows a larger number of people to be accommodated, and the figure which I adhere to is not less than 10 sq. ft. of floor space per person. The ventilation system should not be run continuously, but in short bursts. By maintaining a pressure in the shelter, there is less chance of gas entering. Gas filters are not necessary if the intake is high up.

Emergency lighting should be provided in the shelter, but it must be remembered that hurricane lamps burn up the oxygen in the air.

Faraday House Scholarships

AS a result of the entrance scholarship examinations held at Faraday House Electrical Engineering College on March 28th, 29th and 30th the following awards have been made:—"Faraday" Scholarship of eighty guineas a year, tenable for two years in college and one year in one of the works affiliated with the College, to Mr. G. S. Brosan (Kilburn Grammar School). Maxwell Scholarship of sixty guineas a year, tenable for two years in College and one year in works, to Mr. F. W. F. Lewis (Kilburn Grammar School). An Exhibition of sixty guineas a year tenable for one year in College and one year in works, to Mr. K. H. Ullyatt (Chesterfield Grammar School). Entrance prize of twenty guineas, to Mr. J. A. Cook (Sherborne School).

PROGRESS IN POLAND

Important Electrification Schemes in Hand

By J. Podoski, A.M.I.E.E. (Warsaw)

THE electrification of Poland after the recovery of her independence and the end of the war with Soviet Russia was in a very backward state. Few parts of the country had been industrialised before the war, most of Poland being of a distinctly agricultural character. Military operations, which for six years proceeded without interruption on Polish territory, did much to retard the growth of the nascent electrical industry.

In 1920 there were about 500 power stations in Poland with a total capacity of scarcely 580,000 kW (an average power of only about 1,200 kW). The total yearly output of 1,300 million kWh represented only 44.5 kWh per inhabitant. Since the majority of the power stations were grouped in the western industrial part of the country, the average consumption per capita in the other regions was extremely small.

Twenty years of intensive work have produced considerable results in spite of very difficult economic conditions and of the period of depression between 1930 and 1935. The number of power stations with capacities above 100 kW had increased by 1937 to 1,018 (the aggregate including smaller plants was 2,792) with a total installed power of 1,596,000 kW. The total consumption in that year reached 3.6 milliard kWh, and in 1938 approximately 4 milliards, or an average of 115 kWh per inhabitant. Thus, taking into consideration the natural increase of population, the consumption increased 2½ times in the course of twenty years.

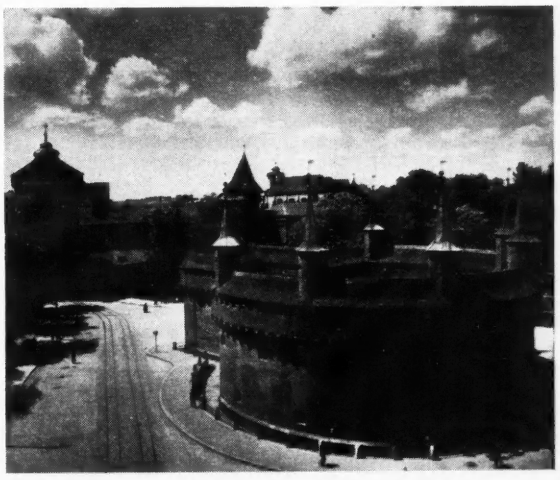
The Lazienki Palace, Warsaw

Electrical Manufacture

During the same period also the Polish electrical industry developed considerably. The value of home production, which in 1925 was zl.31 million (£1 = 25 zloty approx.), attained in 1938 the figure of 200 million, *i.e.*, it increased within thirteen years more than six times. The industry employs (1936 figures) over 13,000 workers in large and small factories.

Home production comprises at the present moment practically all electrical materials and switchgear, with the exception of turbo sets, rectifiers and some special equipment (*e.g.*, high-power radio transmitters, large motors, etc.), home production of which would not pay in view of the insufficient demand.

The imports of electrical materials from abroad complement home production. The value of such imports reached its maximum in 1929, when it rose to almost zl.130 million, whereupon it began gradually to decrease until it reached a minimum of zl.22 million in 1934. From that time the value of imports has been increasing as general conditions have improved, and in 1938 reached zl.57 million. These imports come chiefly from Germany, which supplied goods valued at zl.32,670,000 in 1938—or 57 per cent. of the total imports of electrical materials. The second place was taken by England, with a value of zl.5,760,000—10 per cent. of the total.



The Barbican, Cracow

A 150-kV Grid

The scheme for the industrialisation of the country, now intensively in course of realisation, naturally includes a considerable extension of electrification. It is proposed to extend considerably the 150-kV grid system instituted by the Government. The object of this system is to interconnect the sources of natural gas of the eastern regions with the water sources, situated almost exclusively in the Carpathian Mountains in the south of the country, and also with the coal areas close by the western frontiers of the State. The 150-kV line interconnecting these three areas will constitute in fact a kind of busbar system which will feed the industrial centre districts, now being actively developed, as well as Warsaw and its neighbourhood, this being provided for by a number of northward branches.

Apart from the existing power stations, with a capacity of several hundred thousands of kW, the grid will be fed by a certain number of new thermic and hydro-electric works, some of which are already in course of construction. For instance, the steam power works at Nisko of 40,000 kW are nearing completion, as well as the hydro-plant at Roznow with an installed capacity of 60,000 kW. It is also proposed to construct steam and hydro-electric stations to raise the power available by nearly half a million kW.

New Warsaw Station

Apart from the above scheme, the electrification of the Warsaw district is also progressing. Various economic and tariff considerations restricted electrical development in Warsaw, a city of 1.3 million inhabitants, and the consumption per head did not exceed 100 kWh in 1933. During the last few years, however, there has been a rapid increase in demand; in 1938 there was a record rise of 45 per cent.

Due to this the only two large stations in the Warsaw district —one at Pruszkow and the Warsaw municipal station—had to face the necessity of very important plant extensions. The present capacity of these two stations is about 100,000 kW, and the programme to be carried out in the near future provides for the construction of a new municipal power station with a capacity which will reach 600,000 kW within the next ten years. The existing works will then serve as a stand-by.

Moreover, the connection of the Warsaw district with the group of power stations in the industrial centre districts by means of a 150-kV transmission line is under way. A second similar connection is contemplated between Warsaw and Silesia where, due to the proximity of large coal mines, generation costs are low.

Railway Work

Here should be mentioned also the electrification of the Warsaw Railway Junction carried out by two English companies, the English Electric Co., Ltd., and the Metropolitan-Vickers Electrical Co., Ltd., in collaboration with a number of Polish suppliers. The whole of the three suburban lines with the greatest density of traffic has been electrified. In total some 250 km. of track has been electrified, and the daily number of electric trains arriving in Warsaw reaches 150.

The contract for the electrification of the Warsaw Railway Junction was a transaction characteristic of conditions in Poland. With the exception of the concession for the railway line between Silesia and the Baltic, constructed by French capital, the only form of industrial transaction to be con-

CORRESPONDENCE

Every letter must be accompanied by the writer's name and address preferably, but not necessarily, for publication. The Editors cannot accept responsibility for correspondents' opinions

A Static Phenomenon

ON March 23rd I had just completed a run of 400 yd. of 7/036 v.i.r. cable lead and return on 25-ft. poles and while stripping the cable end I received rather a nasty shock, although the cable was dead. I flashed the cable to earth and continual sparking took place.

The sky was very dull and rain began to fall steadily, but there was no sign of thunder or lightning. As the rain increased the discharge became greater until sparks up to ¾ in. long were continually produced.

When the cable was held with a pair of insulated pliers the sparking continued through the insulation of the cable, and when the cable was taken away from any earthed object a purple ring was seen glowing at the top and bottom of the inch of cable that was left bare.

The second cable, the remainder of which was left on the drum, was hissing like escaping air under pressure. When uncoiled it also was found to be discharging. As the rain and the sky cleared the sparking decreased until it completely vanished. On the day mentioned a balloon flying over Hull was set on fire, presumably by static electricity, and came down in flames.

The opinions of your readers on this subject would be appreciated. At least six people witnessed the occurrence.

Scunthorpe, *April 3rd.* W. A. Turner.

Rules and Registration

I have read the remarks of Mr. P. S. Cattle in your issue of April 7th with sadness and some amazement and take it that he would not be in favour of the necessary reform—compulsory rules and registration.

Mr. Cattle says:—"Why not ask the eight thousand unregistered what they think about it?" Simply because the majority of the eight thousand prefer to carry out installation work as they see fit without any regard to rules and regulations, compulsory or otherwise. He goes on to state that "rules and regulations check developments and improvements" which would indicate that those rules and regulations are superfluous. No self-respecting electrical engineer and contractor could agree with that view.

Personally, if I discovered scamped work on a few points in an installation I should be very suspicious, would advise a thorough examination and if need be a complete renewal. With regard to the altering of bad work, I would point out to Mr. Cattle that under compulsory rules and registration the responsible party or parties would be required to correct any bad work and also make good decorations, &c., disturbed by such work. Mr. Cattle or any other person would then be compelled to have his carpets and floorboards lifted if that were found necessary by a responsible official.

Glasgow, *April 8th.* Alex Milne, A.M.I.E.E.

Electric Razors in Bathrooms

A customer of ours having bought an electric razor insists on using it in the bathroom although we have pointed out that this is both unwise and unnecessary. This razor is of the usual type fitted with a two-core flex and a resistance box terminating in two sprongs to fit a 5-A two-pin socket. At present he uses it from a brass (unearthed) bracket over the basin by means of a 5-A b.c. adaptor. At some time in the past there has been a power plug in this bathroom as there are a pair of live 7/.029 wires sealed off behind a wood block.

Our customer asks for this power plug to be replaced, and we are faced with the following alternatives:—

(a) Refusing to do the job and allowing him to carry on as at present, or losing the customer to a less scrupulous contractor.

(b) Fitting a 15-A three-pin outlet. This would comply most nearly with I.E.E. Rules, but would involve the use of a makeshift adaptor consisting of a plug top, extension flex and connector, whilst the razor would still not be earthed.

(c) Fitting a 15-A two-pin outlet and a fused adaptor. This would be rather safer than above, but would not comply with I.E.E. Rules and would encourage the use of other portable appliances as other power plugs in the house are 15-A two-pin.

(d) Fitting a 5-A two-pin outlet. This would prevent as far as possible the use of any appliances other than the razor, but would contravene the local authority's rule regarding the size of outlets on power circuits as well as I.E.E. Rules but would probably be the safest scheme of the lot.

The views of your readers would be welcome.

London, N.W.3, *April 8th.* B. Rayner.

Progress in Poland (*Continued from previous page*)

templated in Poland is the undertaking in whole or in part of deliveries or construction under a contract. Concessions for the operation of systems when constructed are generally not considered favourably and none has been granted for some years past in the electrical industry. The contracts for the electrification of the Warsaw Railway Junction and the construction of the district power station at Nisko, as well as a number of other, non-electrical, transactions, were based on this principle.

The proposed capital work during the next few years will require considerable funds, and in this connection there are considerable possibilities of collaboration with foreign capital. The schemes would be, in principle, Government undertakings and the orders would bear the character of Government contracts involving the execution of some particular work forming more or less a whole in itself. They would have to be credit transactions, for only on such a basis would they be attractive to the Government.

Until 1937 Poland did not restrict the transfer of funds to foreign countries. Economic conditions, however, and in particular the fact that neighbouring countries had been applying such restrictions for many years, compelled Poland to introduce similar regulations for imports, exports and transactions in foreign currencies. All exports and transfers abroad of foreign currencies and of gold are prohibited without permission of a special Control Office.

Nevertheless, companies in which, after 1938, foreign capital has been invested are entitled to transfer their profits and redemption instalments abroad provided proper evidence of the character of the transfers is furnished.

The commercial and financial relations of Poland with other countries were never very active. So, for instance, the total value of imports into Poland in 1937 was zl.1,254 million (of which Great Britain was responsible for zl.149 million), and exports from Poland amounted to zl.1,196 million (Great Britain zl.219 million). These figures were much higher some ten years ago, when the value of imports was zl.3,362 million (Great Britain zl.314 million) and exports were valued at zl.2,508 million (Great Britain zl.227 million).

It can be seen that, apart from the very important fall in the volume of trade with foreign countries, the nature of the transactions has undergone a definite change, and the adverse trade balance has been reduced to a very small amount. This has had a definite effect on the methods of trade. Imports into the country are limited by quotas determined in advance for particular countries in accordance with the respective commercial treaties and with the export possibilities.

Home production is protected by Customs tariffs, the rates being dependent on the requirements of industry. All raw materials and some semi-manufactured goods are admitted free of duty, whereas articles not manufactured in the country or manufactured in insufficient quantities are given the benefit of substantial reductions of duty.

Non-magnetic Ship Launched

LAST week Mrs. H. Spencer Jones, wife of the Astronomer Royal, launched the R.R.S. *Research* at Dartmouth. The vessel, a 770-ton sailing ship with an auxiliary engine, will be used for gathering data on magnetic variation for the Admiralty. The investigations will include atmospheric electricity and determination of the earth's magnetism at sea, and is equipped with instruments embodying the latest results of scientific research.

PORTOBELLO EXTENDED

New Turbo Set and Boiler Plant

THE permanent end to the main building of the Portobello generating station of the Edinburgh Corporation Electricity Undertaking has now been built and the final extension was officially inaugurated this week by the Rt. Hon. Thomas Mackay Cooper, K.C., M.P., Lord Advocate for Scotland. This brings the generating plant capacity of the station up to 146,500 kW, representing a total capital cost of £2,620,910 (£17.89 per kW installed).

The final extension has cost £488,541 (£16.28 per kW), the main items being: Land, foundations and buildings, £187,787; boilers and pipework, £123,094; and turbo-alternator and condensers, £89,634. The 1938 thermal efficiency per kWh generated was 21.49 per cent., and with the improvements to the station operation brought about by the latest extension, this figure will no doubt be improved upon.

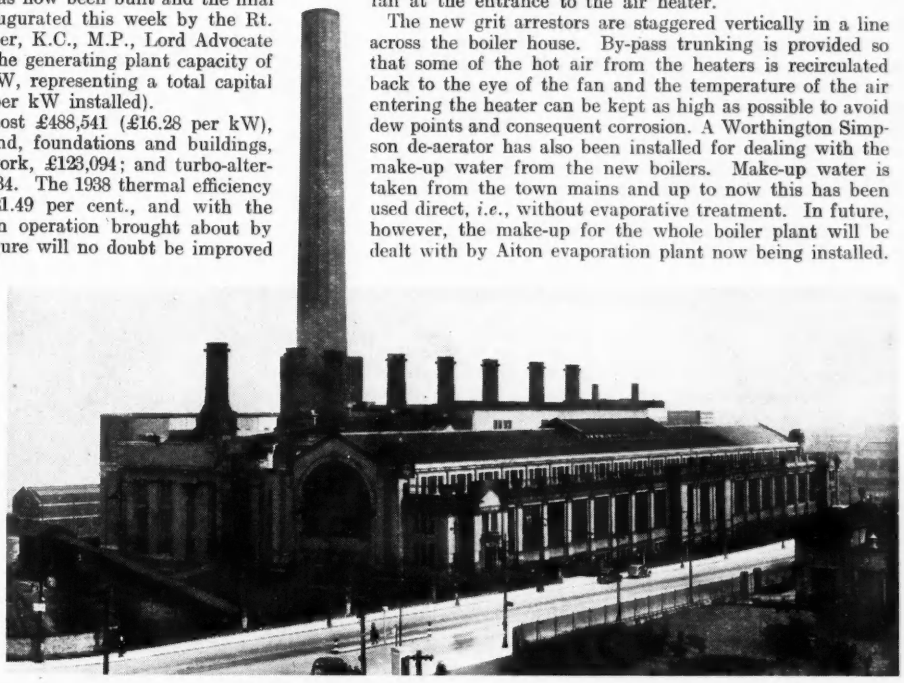
The station has been built in four main sections. The first was completed in 1923 with 37,500 kW of generating plant, the second extension brought the plant capacity up to 54,000 kW in 1925, and two 31,250-kW sets were added in 1930, so that the plant capacity for the few years prior to the installation of the new 30,000-kW set has been 116,500 kW.

The buildings are of steel-frame and brick-panelling construction and they rest on a reinforced-concrete raft supported on piles. The turbine room is now 470 ft. long, 60 ft. wide and 75 ft. high to the ridge. The adjacent boiler house has a wall height of 84 ft. and runs the whole length of the turbine room.

Coal is unloaded from the extensive railway sidings by means of two rotary truck tippers into large hoppers feeding two travelling belts which deliver, *via* an underground route, into bucket elevators on the station site. Finally, the coal is handled by two belt conveyors running the whole length of the boiler house over the bunkers. An extension of these last conveyors serves the two boilers just installed.

The total evaporative capacity of the boiler plant is now about 1,500,000 lb. per hour and the steam conditions throughout are 300 lb. per sq. in. and 700 deg. F. The two new Clarke, Chapman 120,000-lb. per hour boilers are equipped with water-cooled walls, Babcock & Wilcox chain-grate stokers, Green economisers, Ljungström-type rotary regenerative air heaters, high-pressure secondary air fans, Davidson centrifugal grit arrestors and fluid-coupling speed control on the forced and induced draught fans. The oil pressure in the fan couplings is controlled from the boiler firing floor. With the air heaters and grit arrestors the f.d. and i.d. fans are situated above the boilers, each i.d. fan at the foot of the trunking up-take to the chimney and each f.d. fan at the entrance to the air heater.

The new grit arrestors are staggered vertically in a line across the boiler house. By-pass trunking is provided so that some of the hot air from the heaters is recirculated back to the eye of the fan and the temperature of the air entering the heater can be kept as high as possible to avoid dew points and consequent corrosion. A Worthington Simpson de-aerator has also been installed for dealing with the make-up water from the new boilers. Make-up water is taken from the town mains and up to now this has been used direct, *i.e.*, without evaporative treatment. In future, however, the make-up for the whole boiler plant will be dealt with by Aiton evaporation plant now being installed.



Portobello power station, showing new chimney

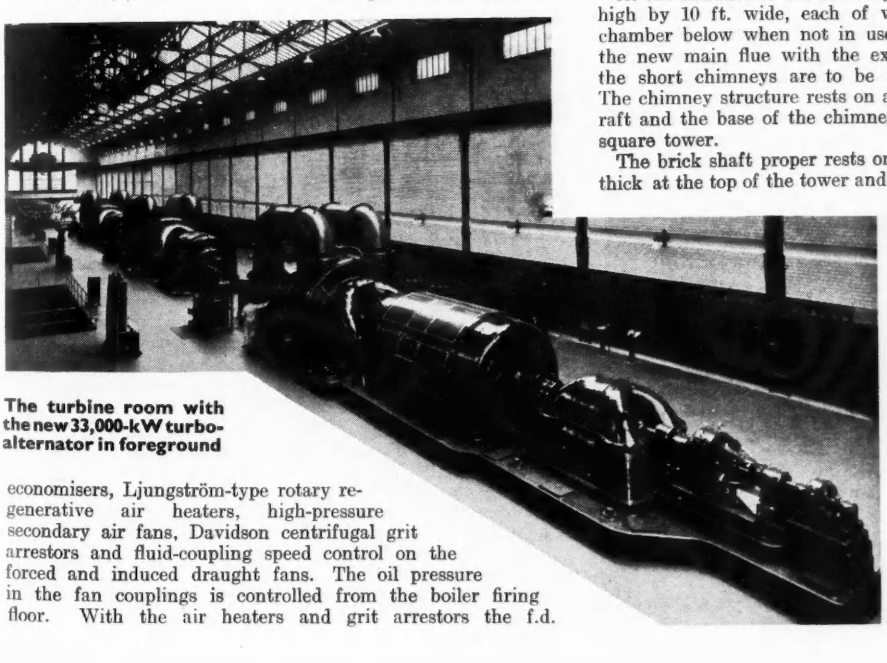
Integrating and indicating instruments for water flow, CO_2 content and water, gas and super-heat temperatures for the two boilers are all housed in a steel and glass chamber built on to the boiler house wall, while the pressure gauges and allied operating instruments are mounted on a panel between the two boilers at the firing-floor level.

As the result of complaints the short chimneys are to be superseded by a high chimney for the whole of the boiler plant. A remarkable feature of this scheme is a new main flue which has been constructed entirely outside the building at a level of 63 ft. from the ground. Supported on reinforced-concrete trestle legs about 50 ft. apart and resting on piling, the flue is 20 ft. high by 17 ft. wide and runs the whole length of the boiler house.

At the entrance to the chimney are two dampers, each 20 ft. high by 10 ft. wide, each of which slides vertically into a chamber below when not in use. Branch flues will connect the new main flue with the existing chimney up-takes and the short chimneys are to be retained for emergency use. The chimney structure rests on a pile-supported ferro-concrete raft and the base of the chimney to 95 ft. above ground is a square tower.

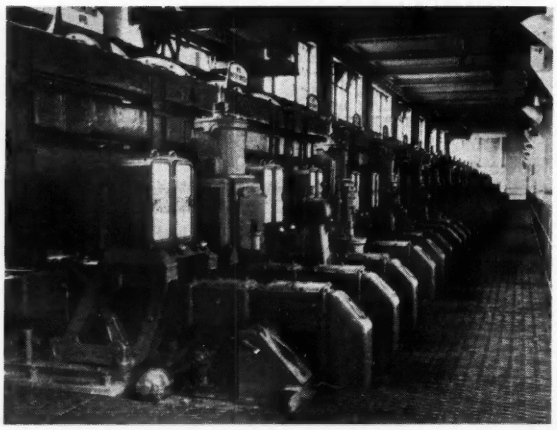
The brick shaft proper rests on a ferro-concrete beam 10 ft. thick at the top of the tower and is circular inside and 16-sided outside. The total height is 350 ft. from ground level and the internal diameter at the top is 22 ft. 3 in. An electric lift will provide access to a platform about 110 ft. from ground level from which the chimney gases will be tested.

We have referred to the tall chimney and main flue as a scheme to overcome the fumes and dust problem, but it seems reasonable that part of the cost of the scheme may be offset against an improvement in operation, and this should also apply to a pneumatic system of ash removal which is being installed.



The turbine room with the new 33,000-kW turbo-alternator in foreground

Exhausters housed in the tower at the base of the chimney will "pull" the ash-laden air first through an adjacent separator in which the ashes will be deposited and finally into



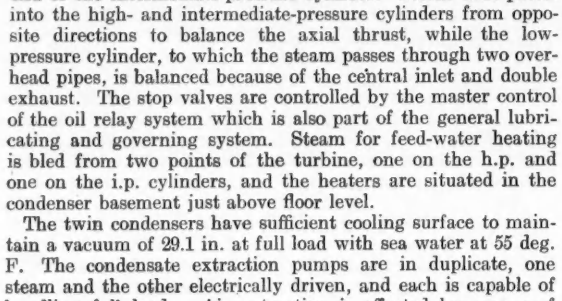
Main 1.5 million kVA switchgear; new units in foreground

a huge silencing chamber which forms that part of the chimney tower below ground level.

The new 30,000-kW turbo-alternator has a Richardsons Westgarth turbine of the three-cylinder type equipped with two steam chests connected to the high-pressure cylinder, the outlet pipes of which pass underneath the set to the alternator end of the intermediate-pressure cylinder. Steam thus passes into the high- and intermediate-pressure cylinders from opposite directions to balance the axial thrust, while the low-pressure cylinder, to which the steam passes through two overhead pipes, is balanced because of the central inlet and double exhaust. The stop valves are controlled by the master control of the oil relay system which is also part of the general lubricating and governing system. Steam for feed-water heating is bled from two points of the turbine, one on the h.p. and one on the i.p. cylinders, and the heaters are situated in the condenser basement just above floor level.

The twin condensers have sufficient cooling surface to maintain a vacuum of 29.1 in. at full load with sea water at 55 deg. F. The condensate extraction pumps are in duplicate, one steam and the other electrically driven, and each is capable of handling full load. Air extraction is effected by means of duplicate three-stage steam-operated ejectors.

Condensing water is drawn from and returned to the Firth of Forth through four tunnels below the sea bed. The fourth and most easterly outlet tunnel has a section equal to the total area of the three intake tunnels. The sea shafts are about 1,600 ft. out from the Promenade. In each land shaft there is a coarse mesh screen and between these shafts and the pumps are three rotary strainers with lignum-vitæ V-shaped blocks. The pumping plant consists of three vertical-spindle



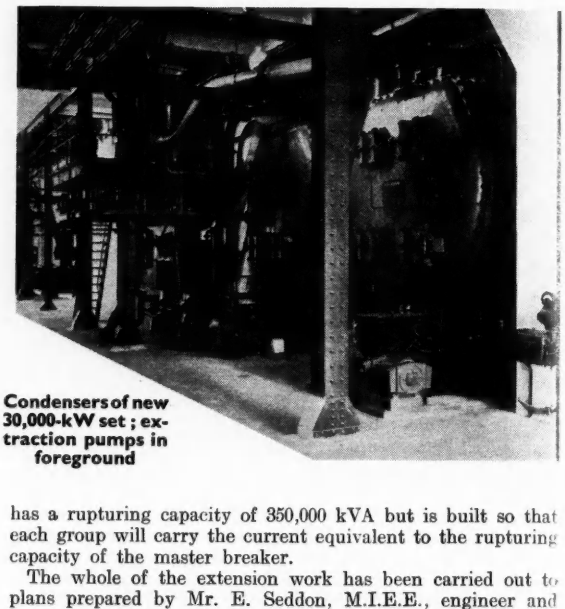
A view of the new 120,000-lb. per hour boilers and instrument panel

pumps, each with a capacity of 30,000 gal. per minute and driven by a 625-HP 6.6-kV AC motor, and four 14,000 gal. per minute pumps, one of which is driven by a DC motor which starts up automatically from the station battery in the event of an AC supply failure.

The English Electric alternator generates at 6.6/7.25 kV, 50 cycles. It is cooled on the totally enclosed system, air circulation being provided by a fan mounted on the main shaft between the alternator and exciters. The field of the exciter is served by a pilot exciter at the end of the main shaft.

The new Metropolitan-Vickers main switchgear includes two master feeder circuit-breakers and one alternator breaker, each of 1.5 million kVA rupturing capacity. It is metal-clad and compound filled, with duplicate bus-bars and complete phase separation. The circuit-breakers are fitted with arc-control devices and inertia trips and are solenoid operated, as are also the selectors and isolators. The main generator breaker is designed to carry 3,500 A continuously and the weight of the three-phase unit complete with oil is 31 tons.

Each master breaker controls a group of three sub-breakers in the adjacent trunk switching station. In the event of a fault the master breaker opens circuit first, then the sub-breaker on the faulty feeder opens on no-load, and finally the master recloses to restore supply to the healthy feeders. A new switchboard, with two groups of sub-breakers and a bus-coupler, has been added to the trunk switching station in conjunction with the two new master breakers. Each sub-breaker



Condensers of new 30,000-kW set; extraction pumps in foreground

has a rupturing capacity of 350,000 kVA but is built so that each group will carry the current equivalent to the rupturing capacity of the master breaker.

The whole of the extension work has been carried out to plans prepared by Mr. E. Seddon, M.I.E.E., engineer and manager, with the assistance of Mr. J. Eccles, B.Sc., M.I.E.E., deputy engineer and manager.

American Domestic Consumption

WRITING in the Edison Electric Institute *Bulletin* for March, Mr. Sherman M. Hall (Consolidated Edison Company of New York) says that in the United States the consumption of electricity for domestic use is influenced principally by the business cycle.

He produces a graph to show that domestic sales recorded a substantial annual increase up to 1930, when the effects of the depression were felt. From 1932 to 1936 the actual sales fell below the trend line and the 1937 figure was the first to rise above that line since the start of the depression.

Other diagrams show the relationship between the general business index and domestic electricity sales. It is seen from these that the domestic energy curve does not exhibit the same degree of fluctuation as the index of general business and that it lags a year behind that index.

In another part of his article Mr. Hall analyses the domestic consumption. He says that although between 1920 and 1938 the energy used for lighting increased, the amount used per consumer remained practically stationary. In 1920 lighting accounted for almost 80 per cent. of the total residential use, whereas in 1938 the proportion was only 35 per cent.

One-fifth of the domestic energy sold is consumed by refrigerators, and radio sets now account for about 10 per cent. of the consumption. Between 1933 and 1938 there was an increase of 160 per cent. in the number of refrigerators in active service but due to increased efficiency the consumption per unit actually fell by 30 per cent.

An increase of 58 per cent. in the number of ranges in use was accompanied by a rise of only 19 per cent. in their consumption. On the other hand the consumption of water heaters rose by 137 per cent., while the number of heaters in service increased by 112 per cent.; and radio sets increased their usage by 128 per cent., although their number rose by only 94 per cent.

THE WORLD'S FAIR

Electricity's Important Part

By George Herrick (New York)

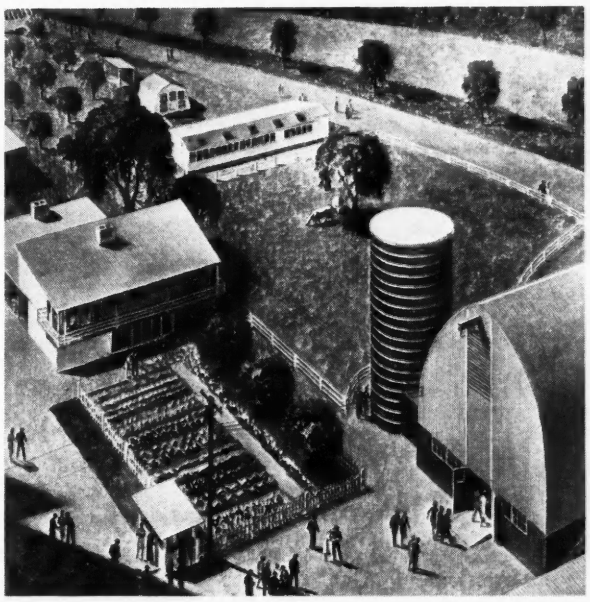
WHEN the New York World's Fair opens its 1,216½ acres officially on April 30th the public will see a demonstration of modern electrical progress that has probably never been surpassed. New designs of lighting fixtures, new lamps, new methods of directing illumination, and sound, motion and light perfectly synchronised will be seen in the Fair grounds and in the many exhibits. Electrical engineers and other technicians, architects, designers and decorators will find the entire Fair one enormous exhibit of the latest in electrical progress.

With their characteristic energy the Americans are going "all out" to make the World's Fair, opening on April 30th, a great success, to which electricity will very largely contribute

Added to the "Electric Farm" and the "Town of To-morrow," there will be a permanent battery of forty searchlights atop the Halls of the Nations, a great regularly repeated spectacle in the "Lagoon of Nations" to which electricity will contribute, and a stirring official opening with a blazing light on the "trylon and perisphere" theme of the Fair. The lighting of the Fair has been contributed by numerous lighting engineers and consultants for individual exhibitors. The Fair generally has been supervised by Bassett Jones and the firm of Morgan, Hamel & Engelken.

One of the most spectacular uses of electricity will be at the official opening when Dr. Albert Einstein will speak. At the close of his address there will be ten flashes of light from the top of the trylon and a deep vibrant sound accompanying each flash will come from the perisphere, which will be illuminated with a "wash" of blue light from mercury vapour lamps concealed beneath. Energy for starting this spectacle will come from a cosmic ray "trap" which is being built in Philadelphia now and will be installed at the Hayden Planetarium in New York.

Illumination of the trylon is by the General Electric Co. It is equipped with twenty-four units built specially for the purpose. The perisphere is illuminated by the Westinghouse Electric & Manufacturing Co. Thirty special projector units were built by the company for this purpose, each one containing nine 400-W mercury lamps. The projectors are equipped with 8-in. special Fresnel lenses. The light will envelope the perisphere in a blue hue from the mercury lighting units. When the signal is given, the light atop the trylon will flash nine times emitting 24,000,000 lumens. This is expected to illuminate the entire grounds. The tenth and final flash will emit 1,240,000,000 lumens. This final flash is expected to be seen throughout New York City and suburbs.



Model of the electric farm which is being arranged at the World's Fair at which over a hundred applications of electricity will be demonstrated

With each flash will be a bell tone from the perisphere. This is electrically operated using a wooden box which contains 6 ft. of piano wire. When struck, the vibration disturbs a magnet flux and sets up currents of electricity which are amplified and sent to a large loud speaker in a well below the perisphere. The sound is claimed to be equivalent to that of a bell 30 ft. in diameter. As this spectacle progresses the grounds will be illuminated.

The other great outdoor spectacle is the Lagoon of Nations fountain. This is a pool 700 by 400 ft. In it 20 tons of water will be spurted into the air with jets rising 160 ft. Its background will be the great "skyline" of the Halls of the Nations with 62 represented. Contributing to illumination, is a series of 585 twin light-projector units almost entirely under water. Each will contain a 400-W mercury arc lamp and a 1,500-W tungsten lamp. Beams will be blended in colour combinations through filters. Each lamp has a hexagonal glass filter revolving above it at one revolution per minute. Colour frames, rotated in either direction, are controlled from a master switchboard. For illuminating the tops of the highest water jets, 12 projectors will be located around the lagoon. All this spectacle is controlled from a main board which is synchronised with orchestral music through loudspeakers. Special music has been composed to be interpreted in both light and sound through the synchronising mechanism.

Throughout the Fair, there will be wide use of exterior floodlighting and in the interiors there is extensive use of directional illumination with use of Fresnel or step-lens spotlights. A flush ceiling fixture has been developed on patents controlled at present by the Fair management. About 2,500 of these fixtures have been installed in different buildings. Fluorescent tube lighting will be seen in many places.

The "Town of To-morrow" stirs visions of life in an age to come. Visitors with such anticipations will be largely disappointed. Most of the fifteen houses in this group are representative of the best current practice in architecture, decoration, wiring, illumination and electrical equipment. From five to ten rooms in size, the homes are of types valued at £500 to £4,000 or more. They will demonstrate in most cases, adequate lighting and wiring of to-day. As it is estimated that only about 2 per cent. of homes are adequately wired for modern electrical appliances and less than 1 per cent. are adequately illuminated, it was decided to emphasise to-day rather than to-morrow. The houses are, in most cases, wired to the minimum recommendations of the National Adequate Wiring Bureau. Modern practice in multiple control light switches, circuit-breakers instead of fuses and sufficient convenience outlets will be shown, including plug-in strips.

Sun lamps as integral parts of fixtures will be included in the more expensive homes and as portable units in lower-priced structures. There will be some use of fluorescent lighting in the more expensive units. In specifying lighting, the Better Light—Better Sight Bureau has provided for 5 to 8 ft.-candles in halls, 10 ft.-candles of general and 25 to 40 ft.-candles of directed illumination in living rooms, 15 ft.-candles of general and 25 ft.-candles of directed in kitchens and 10 to 15 ft.-candles of general with 30 to 40 ft.-candles of directed in bedrooms. The entire exhibit is commercial in its purpose with various electrical and other manufacturers contributing materials and equipment to each home. In each is a "hidden materials room," where concealed materials such as wiring will be exhibited to the public.

One of the exceptions in this group of the "Town of To-morrow" is the glass house being erected by the Pittsburgh Plate Glass Co. The illumination in this two-storey concrete and glass structure represents certain interesting applications of light which are at the same time good practice. This house of glass was designed for the company by Don C. Hatch, architect, New York. The lighting was developed by E. B. Kirk, lighting consultant, New York. One departure is setting all fixtures flush with the ceiling and a wide use of Fresnel lens spotlights. In several cases the steps of the Fresnel lenses (or

risers) are being painted in colours to harmonise with room furnishings so that some colour may be subtly picked up in the general illumination.

No large exposition seems complete to-day without an electrified farm, so the World's Fair has one sponsored by the Electric Utilities Exhibit. More than 100 practical applications of electricity will be demonstrated, including a two-compartment quick freezing and storage refrigerator for perishable farm products, an egg cleaner, grader and latest type candler, a waxing unit to remove feathers and a fruit-cleaning and grading system, electrically driven.

A more spectacular showing by the Electric Utilities is the street of yesterday and to-morrow. The first part is now being constructed and is modelled on a gas illuminated street and shops of 1892. At the end of the street the visitor sees the office of the electricity company celebrating the tenth anniversary of the industry, by displaying incandescent lamps in the shop window at 3s. 4d. Walking through a dark curved passage, the visitor emerges into the office of the modern company. Through plate glass windows a street of the future ablaze with indirect illumination is seen. Another portion of this exhibit is the "Rocket Room" where there will be regular spectacles demonstrating light, colour and motion.

Transportation Exhibits

Among the many exhibit buildings, lighting engineers consider the Focal Exhibit in the Transportation Building, among the most interesting. Electrical equipment plays a leading role here with completely automatic operation and fine synchronisation of sound and light in a series of scenes telling the story of transport from walking to a miniature rocket airport of the future, where a rocket ship to another planet is fired as a finale.

The story is related on a film sound track. This is synchronised to the more than 100 different cues or actions performed by a series of notches in the film edge. As the notches pass through the projector they actuate a Strowger selector switch and it in turn controls relays. As the story unfolds, neon tubing on a large world map is illuminated sectionally. At the end, a miniature rocket airport in the foreground becomes the centre of attention. The rocket gun contains a 5,000-W spotlight with a trip mechanism to actuate a shutter. This is synchronised with a smoke release. As the spotlight flashes indicating discharge of a rocket ship, a small ceiling spot with an iris lens is brought into play by the next notch on the film. The spot is lighted and the iris is set to close at the correct speed to give the effect of a bright object receding rapidly into space. In the background, suspended from the ceiling, are glass planets containing low-wattage lamps. The design of the exhibit is by Raymond Loewy, industrial designer, and lighting effects were developed by E. B. Kirk, consultant.

Floodlighted Gardens

The horticultural exhibit, to be known as "Gardens on Parade," was lighted under supervision of Stanley McCandless, lighting consultant. It promises to contribute much to public education in the possibilities of outdoor floodlighting of homes. The illumination is planned to dramatise and accent lighting on flowers without glare in the eyes of persons walking about the paths. Two 60-ft. towers in the gardens carry six 1,000-W specially designed projectors with ellipsoidal lenses. These exactly outline edges of the gardens but leave paths in shadow. For upward illumination, mercury reflector and moonlight reflector lamps of 150-W each are used alternately and are concealed in hedges. Several specially designed units of birdseye lamps will also be concealed under hedges to throw sheets of light over a given area. White light will be used in most cases, but Mr. McCandless indicates that some tinted illumination may be used when the actual flowers are in place.

Plans were, of course, made for extensive electrical use at the World's Fair and main cables coming in and wiring throughout were designed for heavy loads. The increases over the original plans have been so great, however, that the local electrical utility is beginning to be faced with the problem of furnishing sufficient energy for peak loads, further evidence that it is an electrical exposition in every way.

Industrial Management Lectures

THE Studd Lectures on Industrial and Commercial Management will be held at the Polytechnic, Regent Street, W.1, commencing on April 28th. The lectures are as follows:—"Long Period Finance," by Mr. R. P. Wilkinson (April 28th); "Short Period Finance," by R. A. Wilson (May 5th); "Insurance Against Loss," by A. S. Hinshelwood (May 12th); and "Financing Planning; Insuring for Future Profit," by F. R. M. De Paula (May 19th).

Here and There

By "Nomad"

I'M starting with a grumble this week—a personal one, about showrooms. As I shall be very shortly moving to a new district I set out blithely one Saturday afternoon recently to visit the electricity showrooms there to make certain arrangements. To my surprise and annoyance after a three-quarters of an hour's journey I found myself confronted with the announcement: "Closed at 1 o'clock on Saturdays." Now this is the only time I can conveniently manage, and I can't imagine that I am alone in this respect. Surely this is the one time of the week when conditions are at their best for doing business? Generally speaking, prospective customers are in a happier and more pliable frame of mind on Saturdays and perhaps feel a little less hard up than at other times of the week. Moreover, they are usually not in so great a hurry and it is often the best opportunity for a housewife to obtain her husband's opinion or approval regarding the purchase of apparatus.

* * *

I wrote to the manager of the undertaking about this. His reply was that early closing was compulsory one day a week and that Saturday was considered the most suitable day. Possibly, though I do not believe it, Saturday is better than Wednesday (the general early closing day) but what is wrong with Thursday? Local conditions must, of course, be taken into account, but, while I have every sympathy with the feelings of the showroom assistants on the subject, it does seem to me that the showroom, a very fine and up-to-date one incidentally, is not being used to its best advantage.

* * *

Having got that off my chest, let me turn to another showroom which I *was* able to get inside. It is almost impossible to go down Regent Street, London, without seeing somebody, often a small crowd, looking in the windows of the premises of the Central London Electricity, Ltd. Last week was the first opportunity I have had of going inside since they were opened just over a year ago and I was pleased to hear how popular they have become. Not only does the building cater for the C.L.E.'s own consumers, but engineers, architects, and the general public from all over the country, or for that matter the world, are taking advantage of the advisory services which the company in the kindness of its heart is prepared to render free to all and sundry.

* * *

Certainly the showrooms are among the most up-to-date and elaborate to be seen anywhere, and I doubt whether there is any other place in the country where there is a better permanent, representative display of up-to-the-minute electrical apparatus, especially novelties. I consider that I am fairly well in touch with what is new, but they introduced me to a travelling iron with a handle that folds up flat, an electric butter knife and an almost unbelievably light hairdryer. Chicken roasters with revolving spits I had seen before but they can still be relied on to attract a crowd to the windows.

* * *

One other distinction these showrooms have. They are, I believe, the first in which price tickets made of "Catalin" have been used. This transparent moulded material shows itself most effective for this purpose and is likely to be widely adopted when something a little more "stylish" than cardboard is wanted. While at the showrooms I was also shown a large jar containing soot. This was the "harvest" of the York Shipley air-conditioning plant. Providing for an air circulation of 360,000 cu. ft. per hour this apparatus has been found to have an average consumption of 500 kWh a week, which is very reasonable considering that it provides for both heating and cooling as well as cleaning the air in a building of nearly 60,000 cu. ft.

* * *

Talking of warming large buildings, a well-known heating and ventilating engineer told me that most heating engineers now fully appreciate the advantages of using electrical methods, particularly electric thermal storage, and would, other things being equal, adopt them wherever possible in preference to other means. But what sometimes spoils the chances of electricity is the unnecessary interference on the part of electrical engineers in matters which are outside their province and of which the heating engineers obviously have had more experience. Quite a few jobs have been lost to electricity because of this, I was told, so it is apparently a point worth remembering.

MEETINGS AND DISCUSSIONS

Experience with Million-volt X-ray Tube at St. Bartholomew's Hospital. Data on Line Vibration. Diesel-engine Applications

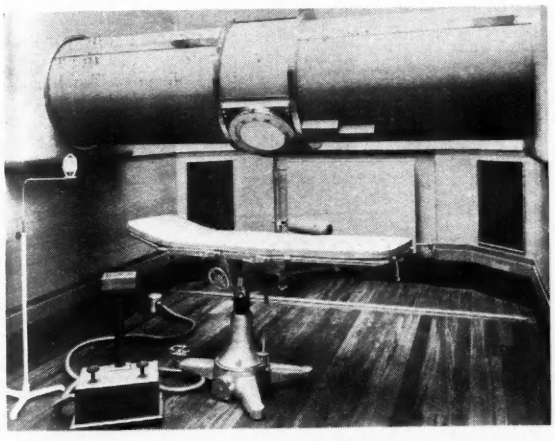
The high-voltage X-ray therapy equipment at St. Bartholomew's Hospital, London, was described and its operation commented upon in a paper presented to the I.E.E. last night. In a Transmission Section paper on Wednesday it was stated that the eddies formed behind the conductor by winds of below about 25 m.p.h. were primarily responsible for the vibration of overhead lines. Developments in Diesel-engine design and application during 1938 were described in a report to the Diesel-Engine Users' Association this week.

X-ray Therapy

A DESCRIPTION of the X-ray tube of unusual design and energised by a one-million volt DC generator which was installed two years ago (the gift of Mrs. Meyer Sassoon) at St. Bartholomew's Hospital in London was described in the paper by Dr. T. E. Allibone and Messrs. F. E. Bancroft and G. S. Innes (Metropolitan-Vickers Electrical Co., Ltd., Mr. Innes being now on the hospital staff) which was read at the INSTITUTION OF ELECTRICAL ENGINEERS in London on April 13th.

The purpose of this installation, the authors stated, was treatment of diseases and not diagnostic examination and the basic reason for employing very high voltage was to produce X-rays of as short a wavelength as possible in order that they should be of sufficient intensity to penetrate deeply so that the biological results of the application of the rays could be investigated.

The central portion of the X-ray tube from which the beam emerged traversed the treatment room and projected into a generator room on each side, each housing a 500-kV DC generator incorporating thermonic rectifiers. The latter and the X-ray tube were evacuated continuously by oil diffusion



The treatment room in the Mozelle Sassoon X-ray department of St. Bartholomew's Hospital, showing the 10-ton X-ray tube *[Elec. Rev. photo.*

pumps, and the whole apparatus was readily demountable. Removable filament assemblies were fitted to the rectifiers and facilitated rapid replacement of filaments, and a special cathode with six interchangeable filaments had been developed for the X-ray tube to avoid frequent admission of air into the tube during filament replacements. The tube was now used continuously at 1,000 kV and had been operated experimentally at 1,100 kV. Several structural changes had been made for reasons explained in the paper, which also fully described the performance of the tube. Curves relating X-ray output with voltage and filtration by metallic filters were given.

Most other high-voltage X-ray tubes had been energised with either pulsating or alternating current. The authors' considerable experience made them confident that much higher voltages could be applied to the type of tube they described, when operating on DC. The flash-over potential of the tube insulators was higher on DC and the tube appeared to operate with greater stability. With this design of tube the capacitance current would be high on AC and introduce further complication. No trouble had been experienced with targets, provided that the focal spot was of reasonable size, which was permissible, since for therapy there was no necessity for a point source of radiation.

The degree of freedom of movement between the patient and the emergent beam was greater than that available on other extra-high-voltage tubes, although some of the other designs could be adapted to give the same freedom. The required freedom was one of the features which had governed the design of the tube to a great extent, and the protection against X-rays was believed to be more complete than on any of the other extra-high-voltage tubes.

No other published intensities were as high as those quoted in the paper. In the case of tubes having transmission-type targets the intensity of the beam emerging in the same direction as the electron beam was so much higher than in other directions that future tubes would no doubt be designed to make full use of this recently discovered fact. Another interesting and most valuable development recently announced by the General Electric Co. was the combined transformer and X-ray tube built into a steel tank filled with CCl_2F_2 gas at a pressure of several atmospheres; this offered the great attraction of economy of space, but sufficient details were not yet available on which to base a considered view.

The tube had been in operation for over two years, during which time it had been energised for 2,800 hours. It had proved reliable in service, and at no time had a vacuum leak developed in any of the vacuum gear during operation, except when the target punctured. Even that only held up treatment for two days.

The design embodying the short path between the cathode and the target had proved to be satisfactory up to the voltage named and had ensured a fixed focal spot and a steady X-ray output. With the addition of the various hoods and mid-potential cylindrical shields the tube had resolved itself into a small central section containing the multiple acceleration electrodes for the electron beam and two long leads bringing the necessary supplies to the required positions. The absence of any electrotechnical restriction to the length of the tube had enabled the hospital authorities to construct a spacious and bright treatment room, conducive to the treatment of patients under pleasant conditions.

Though the tube was primarily designed for therapy it could be used for industrial radiography and would then possess the advantages of gamma-rays with the added one of high intensity. When a radiograph of a composite structure including thick and thin material was required, the shorter-wavelength rays were more suitable than the long in that the scattered radiation was much softer than the original beam and so easily absorbed. Therefore the scattered rays from the thick parts did not completely obliterate the X-ray shadow of the thin parts.

Overhead Line Vibration

THE paper on the vibration of overhead line conductors by Messrs. E. W. W. Double and W. D. Tuck which was read before the Transmission Section of the INSTITUTION OF ELECTRICAL ENGINEERS in London on April 12th was an official communication (Report F/T121) from the British Electrical and Allied Industries Research Association. It commenced with a résumé of available data on the causes of and remedies for wire failure when subject to the "eddy" vibration (the theory of which was outlined) due to steady winds ranging from 5 to 25 MPH.

Failure was shown to be caused mainly by the "nicking" action between wires occasioned by the clamping stresses, and to a lesser degree by the "hammering" between conductor and clamp. The "nicking" weakened the wires locally and thereby prevented full use being made of their fatigue strength. Though it was difficult to reduce the "nicking" action, other data showed that a reduction of wire failure could be obtained by a lowering of the working tension, and the effects of "hammering" reduced by a suitable design of clamp.

In general, light and hollow conductors were said to be more susceptible to vibration than other types. The "non-vibrating" conductor, due to Preiswerk, had an annular aluminium sheath fitting very loosely over the steel core so that there was play between them. Each tended to carry its load independently and was free to "rattle" in relation to the other, so that sheath vibration was claimed to be damped out by the core. Material reduction of the cross-sectional area of the steel core made it doubtful whether such conductors would comply with British breaking load regulations, though

700 miles of this class of conductor was in use in Germany.

To minimise wire failure, methods of reinforcing the conductor at the clamp against the bending caused by vibration, or the use of dampers, festoons, &c., had all been more or less successfully employed, and each had its advocate. It appeared that wire failure could be reduced by a suitable application of either, though it had not been found possible to make a definite statement concerning their relative costs, which in any case must depend on local conditions. In recent years, however, the tendency had been to employ dampers. The "dancing" of conductors was not a very frequent occurrence, and there was difficulty in formulating mitigative measures.

The authors' conclusions were that the eddies formed behind the conductor by winds below about 25 MPH were primarily responsible for the vibration of overhead lines, and that vibration might occur on many of the steel-cored aluminium conductors now in service, particularly on lines where the ratio of conductor weight per unit length to diameter was relatively small, and also on hollow copper conductors. It did not follow, however, that such vibration would always cause wire failure. "Nicking" and "hammering" and the resulting strand failure could be slightly reduced by the use of a "bell-mouthed" and light design of clamp and by the avoidance of short clamps. There was also evidence that "nicking" was less severe with a segmental conductor than with the ordinary type of circular strands, and that the use of aluminium tape round the conductor within the clamp reduced the effects of "hammering."

Wire failure could also be reduced by lowering the working tension, by the action of vibration dampers, or by conductor reinforcement and also effectively reduced by the use of festoons, though line clearance might be decreased.

Diesel Engine Progress

A GENERAL review of the development of the Diesel engine during 1938 was presented at the DIESEL ENGINE USERS' ASSOCIATION in London on April 12th. It commenced with a record of progress in research and design. For instance, at the City and Guilds' College, London, the first appearance of flame was being recorded by a photo-cell opposite a quartz window in the combustion chamber. In supercharging investigations a thermostatically controlled electric heater was used to raise the temperature of the air supply so as to simulate the effect of blowers of varying efficiencies.

Among design problems vibration was still in the forefront, and was becoming more pressing due to the general increase of engine speeds. Flexible couplings between engines and generators were not always practicable, so that dampers and detuners were being made available.

The bulk of the heavy-oil engines built during 1938 for driving electric generators, pumps, air compressors, and other services, had been of the four-cycle description with direct-injection and open-type combustion chambers. In some cases, and the practice was increasing, they had been pressure-charged either by exhaust-gas turbine-driven blowers or by independent electrically driven blowers. With present standard types of medium-speed engines, directly coupled to AC generators of from 250 to 500 kW capacity, the generator output per ton of total (engine and generator) net weight ranged from 7 to 10 kW, calculated to the continuous full-load output of the generator, which was augmented by pressure charging.

Diesel-electric Ships

Regarding marine propulsion, the Rotterdam Lloyd Co. had ordered a ship with 27,000 BHP developed by eight two-stroke cycle single-acting engines operating through "Asea" electric magnetic slip couplings on two propeller-shafts. Several ships had been fitted with this new device.

Diesel-electric propulsion had been adopted in some seven ships during the past year. The most interesting of the larger ships was the Hamburg-American *Patria*, having five eight-cylinder and one six-cylinder engines, running at 250 RPM, producing 15,000 BHP, which was converted to AC, the propeller-shaft running at 115 RPM.

The German *Robert Ley* had six engines, each with six cylinders, 520 mm. bore × 700 mm. stroke, and electric transmission to give 10,000 BHP. A new Clyde ferry had two six-cylinder, four-stroke-cycle single-acting engines developing 250 BHP at 500 RPM, converted electrically to 100 RPM at the propeller.

So far as the coasting trade was concerned, if freights were low, loss of time due to breakdown and overhaul must be cut down to the minimum and the multiple engine scheme with electric drive offered a practical solution. Using modern high-speed engines, it would appear that, even with the addition of the generating sets, the total engine cost would not greatly exceed that of the conventional outfit.

For the larger sizes of traction engine electric transmission equipment had generally been adopted with DC and control gear similar to a fully electric train. There were such advantages in respect of simplicity of control that some loss of efficiency could be overlooked.

For the small marine engine the mechanical gear box had been used almost exclusively, a few electrical transmissions having been used on intermediate sizes of engine only.

Electric and air starting motors were available for comparatively small high-speed engines; they simplified the detailed design of the engine proper, and it would seem desirable that they should be developed up to larger sizes.

Automatic starting sets, generally electrical, were being used to an increasing extent and in larger sizes, so that many of them were now of a size too great for the separate starting motors available on the market. Here again it would seem desirable in the interests of the user that suitable automatic starting equipment should be designed and marketed by the electrical manufacturers in a form suitable for any engine.

I.E.E. Provincial Centres

THE annual reports for the 1938-39 session of the provincial centres of the Institution of Electrical Engineers show that the Scottish Centre membership increased by nine to 806. The average attendance at meetings was fifty-eight and the discussions were considered to be good. The annual dinner was very well attended (320) and the Faraday Lecture attracted fifty members and 457 visitors. A sub-committee is studying means of improving the facilities available to members in Scotland who have received a questionnaire on the subject.

The Dundee Sub-Centre had a membership of ninety-five and an average attendance of thirty-two at meetings. The attendances at two meetings to which members of kindred associations were invited were 150 and 250.

The Scottish Students' Section membership grew by eight to 199. The attendance at meetings averaged thirty, a slight decrease, and nine visits to works took place though the attendances were not good. Two premiums for papers read were awarded to student members of this section.

The North-Western Centre, at which the I.E.E. summer meeting will be held from June 19th to 23rd, increased its membership by fifty-three to 1,433. The attendance at meetings averaged just over 150, speakers averaging nine per discussion; 800 attended the Faraday Lecture and 394 the annual dinner. The use of the library at the College of Technology continued to increase. The Manchester Electrical Engineers' Ball contributed £15 15s. and a golf tournament resulted in £106 being handed over to the Benevolent Fund. The eighth of these golf tournaments, which have contributed £546 in seven years, will take place at the Sandiway Club on May 18th.

FORTHCOMING EVENTS

Institution of Electrical Engineers (*Meter and Instrument Section*).—Friday, April 14th. Institution, London, W.C.2. 7 p.m. "A Critical Survey of American Metering Practice," by Mr. G. F. Shotter.

North-Eastern Centre.—Friday, April 14th. The Newe House, Pilgrim Street, Newcastle-on-Tyne. 6.15 p.m. Annual general meeting. "An Electrostatic Analyser for Complex Waves of Small Amplitude," by Prof. J. C. Prescott.

North-Western Centre.—Tuesday, April 18th. 17, Albert Square, Manchester. 7.15 p.m. "The St. Bartholomew's Hospital X-ray Tube for One Million Volts," by Dr. T. E. Allibone and Messrs. F. E. Bancroft and G. S. Innes.

Sheffield Sub-Centre.—Wednesday, April 19th. Royal Victoria Hotel, Sheffield. 7.30 p.m. "The London Television Service," by Messrs. T. C. Macnamara and D. C. Birkinshaw.

Association of Mining Electrical Engineers (*South Wales Branch*).—Saturday, April 15th. "Electric Shock and Resuscitation," by Dr. S. W. Fisher and Mr. G. M. Harvey.

Yorkshire North-West Branch.—Saturday, April 15th. Wakefield. Annual meeting.

West of Scotland Branch.—Wednesday, April 19th. Craig's Smoke Room, Gordon Street, Glasgow. Annual general meeting.

Lothians Branch.—Saturday, April 22nd. "Standardisation," by Mr. R. Allan.

Electrical Power Engineers' Association (*Midland Technical Group*).—Monday, April 17th. Star and Garter Hotel, Victoria Street, Wolverhampton. Tuesday, April 18th. 7.15 p.m. Electricity Department, Tybridge Street, Worcester. Lecture at both centres on "Ripple Control," by Mr. H. Purslove Barker.

Association of Supervising Electrical Engineers.—Tuesday, April 18th. 2, Savoy Hill, W.C.2. 7.15 p.m. "Electricity in Relation to Public Services," by Mr. Forbes Jackson.

Illuminating Engineering Society.—Tuesday, April 18th. Storey's Gate, St. James's Park, S.W.1. 7 p.m. "Air Cooled High Brightness Mercury Vapour Lamps and their Application to Projection," by Messrs. V. J. Francis and G. H. Wilson.

Institution of Engineers-in-Charge.—Friday, April 21st. King's Hall, Holborn Restaurant, London, W.C.2. Annual dinner.

Electrical Industries Benevolent Association.—Friday, April 21st. Savoy Hotel, W.C.2. 12 p.m. Annual general meeting. 1 p.m. Annual luncheon.

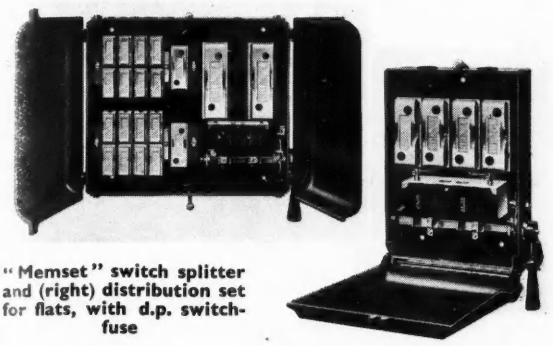
NEW ELECTRICAL PRODUCTS

A review of equipment recently marketed

Improved Splitters

THE Midland Electric Manufacturing Co., Ltd., has recently extended its range of switch-splitters by the introduction of new 15- and 45-A units, while in the other sizes improvements have been made. Shielding of switch contacts is applied in all cases, making it impossible to touch live metal inadvertently.

A new range of distribution sets for use in flats is introduced



"Memset" switch splitter and (right) distribution set for flats, with d.p. switch-fuse

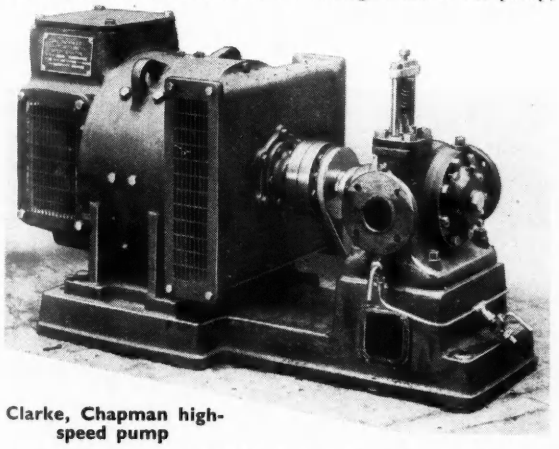
with main double-pole switch and fuses, suitably connected to cooker and lighting sub-circuits, all enclosed in a neat cast-iron case. The new gear complies with the diversity factor (general purposes) requirements of the I.E.E. Regulations.

A new type of rubber bush is fitted to all splitters arranged for conduit entry, so that alternative wiring systems to conduit may be employed. These bushes are of a novel design, one end being sealed, allowing them to act as plugs where necessary.

A High-speed Rotary Pump

As volumetric variation in delivery per revolution governs the maximum speed of rotary displacement pumps, Clarke, Chapman & Co., Ltd., Gateshead, have developed an electrically driven vane pump of this type which has a constant volumetric discharge in order to permit of high running speeds with correspondingly high efficiency.

The rotor is concentric with the casing bore, causing the vane tips to bear truly across their whole width when forming a seal between the suction and discharge sides of the pump,



Clarke, Chapman high-speed pump

thus maintaining a liquid film between the casing wall and the vane tips.

Vane movement is controlled by means of a double cam and rollers at each end of the rotor. The vane is supported for its full radial length when in the outward position by slot extensions in the end flanges of the rotor machined to the same diameter as the casing bore. Thus the vane is always held flat against the working face of the rotor slot, eliminating wear.

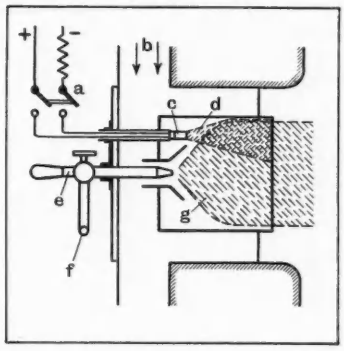
When the vane is in the outward or loaded position and acts as a separating wall between delivery and suction, it is stationary in the slot. When it moves inward to pass over the reduced radius of the separating division, the following vane which is stationary in the slot, then acts as a seal. The inward-moving vane is released of unbalanced pressure by being subject to equal pressure on all sides.

As the fluid is admitted to the slot on the under side of the vane, the space occupied by the latter has a displacement value equal to its full width. The discharge is consequently uniform, enabling silent running at high speeds to be maintained.

Electric Ignition for Oil-fired Boilers

An electrical device which is claimed to ignite the burners of oil-fired boilers in safety is available from Siemens-Schuckert (Great Britain), Ltd., Great West Road, Brentford.

The element consists of a cartridge (*c*) containing a chemical charge, which when electrically ignited produces a tongue of flame at a temperature of 2,000 deg. C. which burns long enough to set fire to the oil issuing from the burner. Duration, temperature and length of flame can be regulated by varying the contents of the cartridge.



a, push-button; b, air inlet; c, flame cartridge; d, tongue of flame; e, oil burner; f, oil-feed pipe; g, oil vapour.

Diagram of electric safety ignition device

The cartridge is introduced into the combustion chamber through a flameproof bushing in which is a plug socket which automatically makes contact with the electricity supply. After exhausting the air in the combustion chamber, the push-button switch of the cartridge is pressed, the control valve being opened simultaneously, and the burner is ignited. The ignition rod is then withdrawn from the bushing, and a spring-controlled shutter automatically closes the opening.

The device is said to enable the boiler to be started up from cold with any kind of fuel oil without pre-heating and to ignite the fuel oil automatically on the opening of the supply valves. It can also be combined with an apparatus for scavenging the combustion chamber before ignition so as to obviate risk of explosion due to residual gases.

Automatic Cookers

When visiting the showrooms of the Hotpoint Electric Appliance Co., Ltd., at 24, Newman Street, London, W.C.2, recently, we noticed that stocks are now being carried of two of the Hotpoint American cookers, the RA-159 and 157.

Drop-down oven doors and tubular radiant boiling plates are fitted. The cookers have three plates loaded at 900, 900 and 1,600 W and the RA.157 has also a "thrift cooker" of 660 W. Automatic oven temperature control is standard, while the white porcelain enamel finish, black enamelled base and smooth exterior without ledges or projectors give the cookers a particularly smart appearance.

The larger model (RA.157) has a warming drawer equipped with a removeable dish rack and a flat flush back. The oven is heated by two 1,350-W elements. The "thrift cooker" is a small hotplate sunk well into the cooker so that a special stewpan can be placed on top, the lid remaining flush with the hob of the cooker.

Hotpoint RA.157 cooker

It is particularly useful for slow stewing, steaming and for purposes for which a bain-marie is used in the commercial cookers.

The smaller cooker (RA.159) has two 1,200-W elements for heating the oven. The external dimensions are considerably smaller than the RA.157—36 in. high by 19½ in. wide by 21 in. deep as compared with 36 in. high by 34 in. wide by 25 in. deep.

EXPORT BUSINESS

Need for Cutting Shipping Costs

By John C. Hancock

WITH the keen competition which exists in overseas markets it is more necessary than ever, if the electrical trader or manufacturer is to retain his share of the export trade, that he shall spend no more in shipping charges than is absolutely necessary.

To a large extent the exporter himself, by exercising a little extra care, can obviate excessive charges on his export goods. In the first place, strict accuracy should be observed in all documents relating to goods for shipment abroad, and secondly, the goods should be declared for freight purposes in such a way that the most advantageous rates are applied to the goods in question. Again, it is well to know whether some articles are best packed separately or included in containers with other goods—and so on.

As already indicated, the exporter should observe strict accuracy when entering particulars of his export packages on the shipping note. It not infrequently happens that the clerk at the dock office inadvertently enters a wrong weight or measurement when rendering his "return" of goods shipped to the shipping office. Without imputing any wilful dishonesty on his part it is pretty safe to say that any such discrepancy would not be in favour of the shipper.

Thus, if the exporter has duly declared his packages correctly on the shipping note and a package, upon arrival at the dock, is weighed or measured incorrectly, it would be noticed that the shipper's figures differed from the wharfinger's. Consequently, the package would be reweighed, and if found to be the same as that declared by the shipper the true particulars would be reinstated.

Again, when lodging bills of lading a complete specification should be attached to each set of bills detailing the separate weights, measurements and contents of individual packages. Having then a double check on the gross weights and dimensions of his export packages the shipper has no obligation to accept complacently the weight or measurement estimated by the shipping company.

Important as it is to furnish exact packing details to the shipping company as a precaution against being overcharged, it is equally important that the contents of the packages shall be declared so that the lowest rates possible are applied to the exporter's goods.

Getting the Best Terms

It must be remembered that a package is freighted according to the highest rated article it contains. A package containing, say, electric lighting fittings and porcelain insulators would be charged at the rate for electric lighting fittings, even though these goods comprised a small fraction of the whole. It is a good policy to avoid, if possible, packing high-rated and low-rated goods together; and it often pays to pack quite small quantities of high-rated goods in separate containers.

Some shippers, though, are apt to describe their goods in generic terms, such as "electrical goods." True, their goods may, in fact, be "electrical goods," but this term can be stretched to cover almost anything from electric irons to resinous insulating compound. Since the freight rate on electrical goods is exceedingly high, the exporter should, legitimately, of course, try to avoid shipping his goods under this description.

While care should be taken to see that the contents of the export packages are not misrepresented or intentionally declared incorrectly, the exporter should lose no opportunity of describing his goods in such a manner as to enable him to cut down his freight charges.

For instance, there is a separate freight rate covering cast-iron goods and while, to take an example at random, cable joint boxes are electrical goods, they are at the same time made of cast-iron. The shipper is quite within his right in claiming the rate for cast-iron goods instead of electrical goods. There are many such instances where lower rates of freight can be obtained by giving the actual description of the goods rather than a general one. House wiring fittings of tinned-brass take a cheaper rate than electrical goods, as do electric wires and cables.

In this connection it may be profitable to note that in some instances separate rates obtain for electric cable and insulated copper wire. While it is not possible in the scope of a short article to detail every alternative description for electrical goods, the exporter would do well to go further into the matter himself on the lines already suggested and compile a schedule of his goods and how best to describe them for export purposes. This can be done by comparing his own goods with the descriptions given in the shipping companies' freight tariffs.

Any effort within reason must be deemed praiseworthy if it is going to satisfy the customer, but the exporter cannot disregard his own economy. In an endeavour to get the goods into the customer's possession without any delay the exporter will often despatch them as soon as they become ready, thus making two or three small shipments when one would have sufficed. On the face of it this may seem an enterprising way of doing things, but, apart from the fact that the customer will have to attend to two or three separate customs clearances at his end, the exporter may have to bear two or three minimum freight charges, a point often overlooked.

For example, the shipping companies are entitled to make a minimum charge per shipment. Let us suppose that a package weighing 2½ cwt. is to be shipped abroad, the rate of freight on which amounts to 80s. per ton. The actual charge *pro rata*, would be 10s., but, owing to the existence of the minimum freight rule, it is quite possible that anything up to 21s. would have to be paid. In other words, 5 cwt. could be sent as cheaply as 2½ cwt. Apart from the extra freight costs involved, there are such items as the cost of bills of lading (say, 2s. a set) and foreign postages to be taken into consideration, to say nothing of minimum charges for wharfage.

Groupage Service

Sometimes it is not possible to avoid shipping small consignments, in which case the minimum freight question can often be overcome by shipping the goods on a parcels ticket, provided the value of the shipment does not exceed £5. Another way is to consign the shipment through a forwarding agent who specialises in what is known as a groupage service, which, briefly, is this: Goods in small quantities are accepted from several different shippers and included on a general bill of lading to avoid a minimum freight. The consignee obtains delivery of the goods by means of a delivery order issued by the overseas branch or agency of the forwarding company.

For some time groupage services have been in operation between this country and the Continent. These services are now being extended, and it is possible to send quite small packages *pro rata* to Australia and the East.

Floodlighting Playgrounds

A MEMORANDUM on the floodlighting of playgrounds and playing fields prepared by the National Fitness Council for England and Wales and published by H.M. Stationery Office (price 2d.) emphasises the advantage of such installations, at present few in number but increasing as earlier successes become more widely known. There is an undoubted need for such facilities, the Council states, especially in large towns.

An objection sometimes raised is the possible injury to eyesight, but it is contended that there is no evidence to justify this fear and it is considered that there is no more economical means of providing facilities on a similar scale.

On the possible types of illumination it is stated that electric floodlighting is by far the more common, but evidence of the effectiveness of gas is also available. No serious technical difficulties are involved, but the question of "daylight" as opposed to artificial lamps deserves consideration. Details of several installations are given and illustrated. On the cover of the memorandum appears a photo of a rugby ground at Norbury illuminated by twelve 1,000-W lamps mounted on 12-ft. iron poles placed 25 ft. from the touch line on one side. Although intended to light only half of the field effectively, the field is well lighted and play is by no means confined to one half. The cost of installation was £204. The cost of equipping two netball courts at Tottenham was £100 each, and recent installations in school playgrounds in London have cost from £46 to £115.

In an appendix on electrical floodlighting installations for sport purposes intensities of from 8 to 12 ft.-candles on the horizontal plane are recommended, according to the type of game. For tennis courts six reflectors containing 500-W lamps should be placed along each side at intervals of 17 ft., with a height of 15 to 20 ft. Fewer and larger lamps may be used, but the end lamps must be behind the base line. Suggestions are similarly made for the lighting of grounds for other games.

The memorandum has been issued after an inquiry lasting several months and is being circulated to 1,641 local authorities, 22 area fitness committees and many voluntary organisations.

In the Courts

Sequel to Fatal Accident

THE Court of Appeal consisting of Lords Justices Scott, Clauson and Finlay on April 4th delivered judgment in the appeal of Mr. George Youngman and his wife, of Ellingham, near Bungay, Suffolk, from the judgment of Judge Rowlands at the Beccles County Court dismissing the action which they brought against Pirelli-General Cable Works, Ltd., to recover damages for the death of their son, Mr. A. E. S. Youngman, who at the time of the accident which resulted in his death was working for the defendant company as a foreman linesman on electrical construction work at the new munition works at Chorley, Lancs.

On July 13th, 1937, Mr. Youngman, whilst fixing wire on a pole was killed, as it was alleged, by an electric shock. The plaintiffs' case was that the defendants were liable by reason of an alleged breach of the Electricity & Building Regulations issued under the Factory & Workshops Act, 1901.

Defendants denied that they were liable for Mr. Youngman's death and said that he had been guilty of contributory negligence. They further denied that they had committed any breaches of the Regulations and asserted that the area where the accident happened was not a factory within the meaning of Section 105 of the Act.

The County Court Judge decided that the plaintiffs had not fulfilled the onus which was upon them of proving how the death of their son was brought about.

(The case was reported in the ELECTRICAL REVIEW of February 10th.)

By a majority of the Court (Lord Justice Scott dissenting) the Court dismissed the appeal. Lord Justice Clauson, in delivering judgment, said there was no evidence how the dead man came into contact with any live electrical point or evidence of negligence by anyone. The County Court Judge took the view that negligence could not be imputed to the defendants.

The question was whether there had been any breach of statutory duty. The County Court Judge held that the evidence did not establish any breach of the regulations. He (the Lord Justice) agreed that there was no evidence of a breach of the regulations by the company and in these circumstances he thought that the appeal failed and should be dismissed.

Lord Justice Finlay concurred, but Lord Justice Scott dissented. He said he considered that the judgment of the County Court Judge could not stand on the issue of liability under the electricity regulations, which provided there should be adequate installation protection for workpeople. It was not clear how the accident happened but there was a theory that it was due to a leakage through a tie-bar. Had that bar been adequately insulated the accident would not have occurred.

In these circumstances the plaintiffs had no need to establish negligence and the fact that the company did not know of the danger was no answer. He thought that the appeal should be allowed.

By a majority of the Court, therefore, the appeal was dismissed and the plaintiffs were granted leave to appeal to the House of Lords.

Action for Damages Fails

In the King's Bench Division on April 4th Mr. Justice Hilbery delivered his considered judgment in the action brought by Miss Hilda V. Stimpson (suing by her father) against Standard Telephones & Cables, Ltd., to recover damages for personal injuries which she sustained in April, 1935.

Miss Stimpson's case was that when she was engaged in operating a blue print drying machine her left hand got caught in the rollers of the machine causing severe burns and permanently impairing the flexibility of the hand. She alleged that the defendants had been guilty of negligence in failing to have a supervisor superintending the work; in causing or permitting Miss Stimpson to eat while working, through her having to work long hours without rest and refreshment; and that the defendants had been guilty of a breach of the Factory and Workshops Act through failing to properly fence the machine and in not providing a switch within reach of the operator to enable her to stop the machine.

The defence was a denial of the negligence alleged and a plea that Miss Stimpson had herself been guilty of contributory negligence through eating against orders whilst operating the machine. Defendants further denied the alleged breach of any statutory duty by them and contended that the place where the accident happened could not be deemed to be part of the factory for the purposes of the Act of 1901 and that the plaintiff's action was barred owing to her having received compensation under the provisions of the Workmen's Compensation Acts from the date of the accident to March 19th, 1936.

(The proceedings at the trial of the action were reported in the ELECTRICAL REVIEW of March 17th.)

His Lordship, after stating the facts and the evidence, held that the place or room where the accident happened must be deemed to be a factory within the meaning of the Act of 1901 and that the defendants had been guilty of neglecting their statutory duty in having failed to properly fence the machine.

But he also held that that breach was not the cause of the accident to the plaintiff and that she had failed to satisfy him that the failure to fence the machine was the cause of it. At the time of the accident Miss Stimpson was eating sweets (which she knew was against the regulations) and had in her right hand a packet of them. He must hold that the action failed and would be dismissed with costs.

His Lordship added that if Miss Stimpson had established that she had a cause of action he would have awarded her £750 damages.

Inadequately Fenced Power Press

At Wednesbury, on April 4th, the Seal Conduit Co., High Bullen, Wednesbury, were summoned in two instances for failure to fence a power press in their works. Defendants pleaded guilty to one of the summonses, and the second was not proceeded with.

For the prosecution Miss A. G. Dennistoun (H.M. Inspector of Factories), stated that defendants manufactured electrical conduits, and on December 15th there was a power press in use in the factory for clipping and dishing the ends of long strips of metal.

On the day in question, an employee, James Norton, who was accustomed to using the press, put his hand round the side of the press to sweep away some clippings which had collected on the bottom of the tool. The machine accidentally operated and caught his hand and he lost the top joint of his second finger and the two top joints of the first finger of his right hand. At the time there was a guard of sorts on the press, but at the side there was an open space 9 in. high and 11 in. wide through which Norton used the tool.

Miss Dennistoun submitted that the fencing was not secure within the meaning of the Act.

For the defence, Mr. E. E. Brown said that when the press was purchased a few months earlier a guard was supplied and the defendants were told that it was efficient for all purposes. The firm provided a poker for removing the clippings and that morning Norton used the poker, but later when he mislaid it he used his hand. This was the first accident of this type that the firm had had.

Imposing a fine of £15, with costs, the Stipendiary said it was the stupidity of the workman that brought about the accident, but if machinery were properly fenced workmen could not do such stupid things and get maimed.

Parliamentary News

(BY OUR SPECIAL REPORTER)

Emergency Plant Reserve

ON April 4th and 5th the Civil Defence Bill was discussed and read a second time in the House of Commons. Clause 33 (1) gives the Central Electricity Board power, with the approval of the Electricity Commissioners, to acquire and maintain emergency reserve plant and distribute it in the case of need. Clause 33 (2) reads as follows:—

> (2) The Central Electricity Board shall defray any approved expenses incurred, whether before or after the passing of this Act, by any other electricity undertakers in taking measures for securing the due functioning of their undertaking in the event of hostile attack, and there may be paid out of moneys provided by Parliament to the Central Electricity Board towards—(a) the expenses incurred by the Board under the preceding provisions of this subsection; and (b) the approved expenses of the Board incurred, whether before or after the passing of this Act, on the measures mentioned in subsection (1) of this section; and (3) the approved expenses of the Board incurred, whether before or after the passing of this Act, on measures to secure the due functioning of their own undertaking in the event of hostile attack; grants not exceeding one-half of those expenses.

Mr. Burgin, the Minister of Transport, in explaining the clause, said that with electricity generating stations the question of vulnerability arose in a marked degree. They had seen, even in peace-time, without sabotage, but merely by accident, the possibility of one generating station giving out and pulling another with it. Therefore, they had adopted the principle of constituting a pool of reserve switchgear, stores and essential technical parts, and had arranged for a contribution of 50 per cent. of the cost.

The financial resolution on which the Bill is founded contains provisions for the payment of Exchequer grants to the Central Board as specified above and also 50 per cent. of the approved expenses incurred by other electricity authorities in taking measures of securing the due functioning of their undertakings in the event of hostile attack, including the acquisition and maintenance of emergency plant.

The Blackpool Failure

On April 5th Mr. R. Robinson asked the Minister of Transport when the report made by the chief engineering inspector of the Electricity Commissioners as to the outcome of the public inquiry into the causes of the failure of electricity supply in Blackpool, Lytham St. Annes and the Fylde Coast during January would be published; and whether the inspector had suggested to the Commissioners any means of preventing such a breakdown in the future.

Mr. Burgin said that the Electricity Commissioners would publish the report as soon after Easter as possible. As regarded the second part of the question, his hon. friend would no doubt await the terms of the report.

PERSONAL AND SOCIAL

Information regarding new appointments and other matters of interest for this page are welcomed

ARISING from a review of the organisation, the London Passenger Transport Board has made a number of appointments which became effective on and from April 3rd. **Mr. T. E. Thomas,** who was general manager (Road Transport), has become general manager (Operation) in charge of both the railway and road transport operating departments. Mr. Thomas has had wide experience in the operation of all forms of surface transport. He entered the drawing office of the London United Tramways Company in 1899. Two years later he was engaged in electrification work under the late Sir Clifton Robinson, the managing director. Later he was appointed resident district engineer. When the London United Tramways Co. was absorbed by the Underground Group in 1910, Mr. Thomas was transferred to publicity and traffic work for the group. In 1913 he became commercial assistant, dealing with fares, routes, etc., consequent upon the group having acquired the London General Omnibus Co. Appointment as development superintendent of the London County Council Tramways followed in 1917, when he was selected in competition. In 1925 he was appointed traffic manager and in 1930 he succeeded Mr. Bruce as general manager. Mr. Thomas was appointed general manager of the Transport Board's tramways in October, 1933, and became general manager (Road Transport) in control of the Board's buses, trams and trolleybuses in February, 1936. He is a foundation member and gold medallist of the Institute of Transport and has been elected president for the year commencing October 1st. He is also chairman of the Tramways, Light Railways and Transport Association.

Mr. T. E. Thomas

Mr. J. H. F. Benford, who was attached to the vice-chairman's office, has become assistant to the general manager (Operation). Mr. Bedford was educated at St. Dunstans College, Catford. He joined the Thames Conservancy Board on leaving school and served in France, Egypt, Palestine and Syria during the war. When demobilised he had reached the rank of major and had received the 1914 Star and the Military Cross. After the war he joined the London General Omnibus Co. In 1937 he was appointed an officer and secretary to the Traffic Committee of the London Passenger Transport Board.

Mr. G. P. Barnett, who was staff superintendent (Central Buses) is now staff superintendent of Central Buses, Trams and Trolleybuses, Country Buses and Coaches. Mr. Barnett joined the Secretary's office of the London Road Car Company in May, 1900, and in 1912 was appointed one of the three chief divisional inspectors in the London General Omnibus Co. Later that year he was appointed traffic auditor and became assistant to the operating manager in 1914. In 1919 Mr. Barnett became road superintendent and in 1925 was appointed assistant traffic superintendent, a position he held until he became staff superintendent of the London General Omnibus Co. in 1931. Upon the formation of the London Passenger Transport Board in 1933 he was made staff superintendent (Central Buses).

Mr. G. P. Stuart Clark, who was divisional superintendent (Central Buses), has become indoor superintendent (Central Buses). Mr. Stuart Clark was educated at Dulwich College and London University. He gained engineering experience in the workshops of the Daimler Co., Ltd., until 1915, when he was granted a commission in the Mechanical Transport in June, 1915. He served in France until March, 1919, when he was invalided home. After service with the Daimler Hire, Ltd., he joined the L.G.O. Co., Ltd., in 1920. He became an officer in 1932 and was appointed divisional superintendent attached to the operating manager (Central Buses) for liaison duties in 1934.

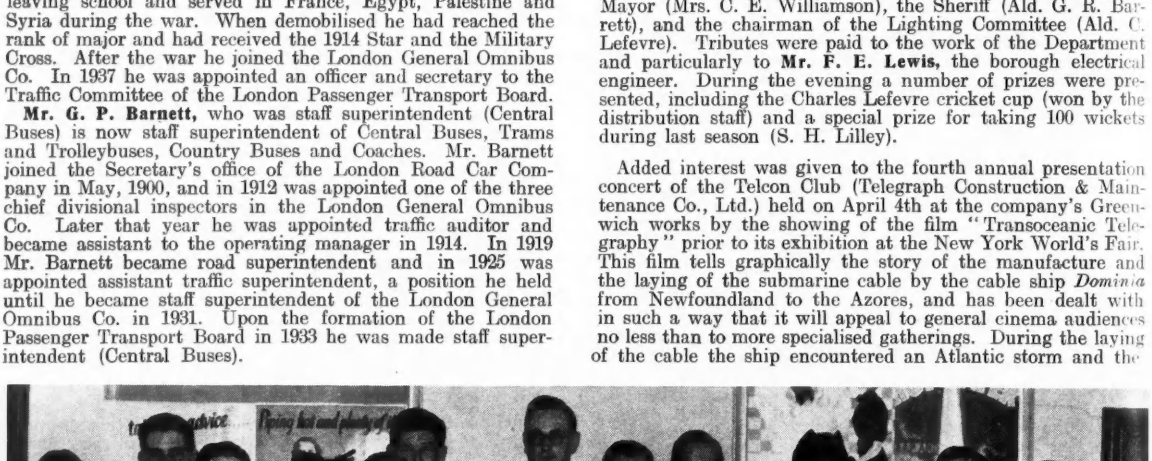
Mr. J. Cliff is now in charge of the Staff Department, and **Mr. G. H. Brooks,** at present general superintendent (Road Transport), has been transferred to the Staff Department as deputy chief staff officer. In consequence of the resignation of Mr. E. Rawdon Smith, **Mr. W. P. N. Edwards,** assistant superintendent (Outdoor—Railways), has been appointed public relations officer jointly with **Mr. F. Scothorne,** assistant public relations officer.

Mr. H. E. Taunt, commercial assistant and consumers' engineer with the Bromley Electricity Department, has been appointed commercial manager to the Chichester electricity undertaking.

The Eastern Section of the Electrical Contractors Assoc. (Inc.) held a regional conference at Colchester on April 5th, and in the evening members attending were the guests of the Colchester Branch at a dinner and dance at the Red Lion Hotel. Over 150 representatives of the industry from all parts of the country were present. The function was in aid of the Electrical Industries Benevolent Association. **Mr. D. H. Butcher,** Colchester, presided, and the guests included the Mayor and Mayoress of Colchester (Councillor and Mrs. H. H. Fisher). Mr. W. Riggs, president of the E.C.A., gave the toast of "The Electrical Industries Benevolent Association," and Mr. H. S. Fothergill, secretary of the E.I.B.A., responded. Mr. L. C. Penwill, director and secretary of the E.C.A., proposed "The Ladies and Distinguished Visitors," the Mayor of Colchester responding. Mr. W. F. Moir, chairman of the Electric Lamp Manufacturers' Association, proposed the health of the chairman.

The annual dinner of the Canterbury Corporation Electricity Department was held on March 31st and was attended by the Mayor (Mrs. C. E. Williamson), the Sheriff (Ald. G. R. Barrett), and the chairman of the Lighting Committee (Ald. C. Lefevre). Tributes were paid to the work of the Department and particularly to **Mr. F. E. Lewis,** the borough electrical engineer. During the evening a number of prizes were presented, including the Charles Lefevre cricket cup (won by the distribution staff) and a special prize for taking 100 wickets during last season (S. H. Lilley).

Added interest was given to the fourth annual presentation concert of the Telcon Club (Telegraph Construction & Maintenance Co., Ltd.) held on April 4th at the company's Greenwich works by the showing of the film "Transoceanic Telegraphy" prior to its exhibition at the New York World's Fair. This film tells graphically the story of the manufacture and the laying of the submarine cable by the cable ship *Dominia* from Newfoundland to the Azores, and has been dealt with in such a way that it will appeal to general cinema audiences no less than to more specialised gatherings. During the laying of the cable the ship encountered an Atlantic storm and the



The judges and competitors at the finals of the E.D.A. Public Speaking Competition, a report of which appeared in last week's issue (page 507)

story of the work carried on in mountainous seas is a thrilling episode in the history of submarine cable-laying.

During the evening **Sir Geoffrey R. Clarke** (managing director) presented many trophies and prizes for cricket, indoor games, golf and shooting, and in a short speech mentioned that the company had passed through difficult times, but was now on the road to a happy and prosperous future. The concert was an excellent and varied one, which concluded with community singing to the "Concord" accordion band.

Mr. J. McDermott, M.I.E.E., retired on March 31st from the position as manager of the power plant department of J. Dickinson & Co., Ltd., Apsley Mills, Hemel Hempstead, after twenty-six years' service. **Mr. J. M. Walshe,** A.M.I.Mech.E., has succeeded him.

Mr. W. Holttum, M.Eng., has been elected chairman of the Mersey and North Wales (Liverpool) Centre of the Institution of Electrical Engineers for the 1939-40 session.

Rowlands Electrical Accessories, Ltd., are creating a sales promotion department, which will provide closer contact between their sales representatives and their illuminating engineering and research departments. **Mr. H. Hinton,** who has been manager of the Devonshire Street assembly works since their inception, has been appointed manager of the new department.

Mr. H. Hinton

Lord Merthyr has been appointed chairman of the St. Austell & District Electric Lighting & Power Co., Ltd., in the place of the late Mr. E. W. Oakley.

Mr. H. G. Nicholls has been appointed assistant manager in the Government and Railways Department of the General Electric Co., Ltd. He joined the G.E.C. in 1892 and entered his present department during the war. He succeeds Mr. R. C. Giggins, who was recently appointed manager of the department following the death of Mr. W. E. Maddams.

Mr. N. Hunter, A.M.I.E.E., who as we have already reported was offered the position of borough electrical engineer at Barnstaple, has withdrawn his application and will continue as borough electrical engineer at Morley. At the monthly meeting of the Morley Corporation last week it was decided to increase Mr. Hunter's salary to £750 per annum.

Mr. H. Moss has been re-elected president of the Bradford Engineering Society for 1939-40.

Mr. H. Long, A.M.I.E.E., of the Benjamin Electric, Ltd., has removed to 115, Hampton Lane, Solihull, Birmingham.

Mr. G. M. Maddock, M.I.E.E., who recently retired from the position of assistant staff engineer of the Post Office Engineering Department, has joined the technical staff of the Power Equipment Co., Ltd., Hendon. Mr. Maddock has just completed twenty-seven years' service in the Post Office Engineering Department, having previously been on the engineering staff of the National Telephone Co., Ltd.

Mr. J. H. Harpin, A.M.I.E.E., of "Thurston," Hoole, Nr. Preston has been appointed to act as technical representative for Wm. Sanders & Co. (Wednesbury), Ltd., in the counties of Westmorland, Lancashire, Cheshire, Flintshire, Denbighshire, Merionethshire, Caernarvonshire, Flintshire, and the town of Oswestry, in succession to W. T. Rawcliffe & Son.

Professor A. Ferguson has been elected president of the Physical Society for the year ending March, 1940.

OBITUARY

Prof. D. Burns.—The death has taken place at Carluke, Lanarkshire, of Professor Daniel Burns, Emeritus Professor of Mining Engineering in the Royal Technical College, Glasgow. He was a colliery manager, a member of the Council of the Institution of Mining Engineers, a member of the Survey Committee for Scotland under the Department of Scientific and Industrial Research, and a member of the Joint Board of Studies in Applied Science of the University and the Royal Technical College. He was keenly interested in the application of electrical machinery to mining, and was a founder of the firm of Anderson, Boyes & Co., mining and mechanical engineers, Flemington, Lanarkshire.

Mr. David B. Anderson, one of the sales engineers in Scotland of Ferranti, Ltd., died in Edinburgh on April 3rd after an illness of several months. Mr. Anderson, although only in his thirty-sixth year, had been in the company's service nearly twenty years. He was a son of the late Mr. A. B. Anderson, who will be remembered by many of the older members of the industry as a one-time general manager of the company, who lost his life when the *Empress of Ireland* went down in the St. Lawrence. Mr. Anderson leaves a widow and three children.

Mr. E. W. Fraser-Smith, secretary and treasurer of the North-East Coast Institution of Engineers and Shipbuilders, died on April 5th. Mr. Fraser-Smith had been secretary and treasurer of the Institution since the latter part of 1911.

Mr. J. L. Gunn.—The death occurred on Monday of Mr. James Lowe Gunn, general manager of the Nottingham Passenger Transport Department.

Mr. R. C. Clay.—We regret to report the death at the age of sixty-nine of Mr. Robert Carpenter Clay, A.M.I.E.E.

Wills.—Sir Thomas O. Callender, deputy-chairman and managing director of Callender's Cable & Construction Co., Ltd., and a director of a number of other electrical companies, left £383,276, with net personalty £344,237.

Mr. P. Hookham, a director of Chamberlain & Hookham, Ltd., left £23,886 (net personalty £23,825).

NATIONAL SERVICE

The I.E.E. and the Central Register

PROFESSIONAL and scientific bodies are co-operating in the compilation of a Central Register of their technically qualified members, which is being established by the National Service Department of the Ministry of Labour.

This Central Register will contain the names of persons of scientific, technical, professional and higher administrative qualifications who would be prepared in war time to serve on appropriate paid work in their professional capacity.

A Central Register Advisory Council, consisting of representatives of the service departments, employers and the major professional, scientific and technical organisations, functioning through committees dealing with different branches of work, has been appointed by the Minister of Labour to advise him on the work of the Central Register.

The Institution of Electrical Engineers is represented on the Advisory Council by its president; he and one past-president are members of the General Engineering Committee, which has in turn set up an Electrical Engineering Sub-Committee consisting of Dr. A. P. M. Fleming (chairman), Mr. J. R. Beard (deputy chairman), Col. A. S. Angwin, Sir Noel Ashbridge, Mr. E. S. Byng, Dr. C. C. Paterson, Col. Sir T. F. Purves and Messrs. P. L. Riviere, C. Rogers, C. R. Westlake, Johnstone Wright and H. T. Young.

This Sub-Committee, in a national emergency, will advise the Minister of Labour on the use of the electrical engineering section of the Central Register and it is also advising the Minister on the schedule of reserved occupations.

Each member of the I.E.E. (except companions and students) residing in Great Britain and Northern Ireland, will receive a registration questionnaire with very full instructions for completing triplicate cards. The red and buff cards should be filled up and returned to the I.E.E., while the white card can be retained as the member's own record of particulars furnished by him. Members of all classes who will be prepared in war time to serve on appropriate work in their professional capacity and to accept such suitable work as may be offered to them, except in so far as they may be then already engaged on work of greater national importance, are invited to offer their services to the Government in this way.

In war time steps would be taken to determine the priority of work from the point of view of national importance, but members should not be deterred from offering their services because they are already under an obligation for other forms of national service, or are at present engaged upon work regarded as of national importance.

The Electrical Engineering Sub-Committee will not select persons without advising their employers, if any, and it will take account of any representations made by the employers. Members who volunteer their services by including their names on the Central Register are not precluded from undertaking additional forms of national service.

In addition, apart from co-operation in the establishment of a national register, the I.E.E. itself desires to prepare a record of the qualifications of all its members so that complete data may be available in a national emergency for co-ordinating the electrical engineering resources of the nation. Members of all classes who may not at present be prepared to offer their services to the Government are therefore urgently requested to complete the red registration card and return it to the I.E.E. as soon as possible. This applies also to those who are at present employed in branches of H.M. Forces and the Civil Service.

COMMERCIAL AND INDUSTRIAL NEWS

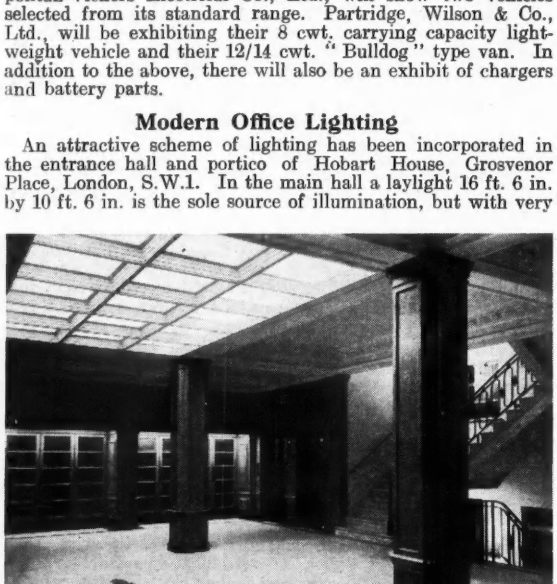
Vehicle Exhibition at Wanstead. New Slough Electrical Association. A Cinema Lighting Installation. S.W.S. Co.'s Exhibition at Hereford.

Electric Vehicle Exhibition

AN electric vehicle exhibition is to be held on April 25th, 26th and 27th at the Eagle Hotel, Wanstead, when the vehicles will be displayed outside the hotel in the car park. The following are the members of the Association who will be exhibiting, together with their exhibits:—Associated Electric Vehicle Manufacturers, Ltd., will be exhibiting a light-weight tower wagon and a 20 cwt. carrying capacity van, both of the Morrison type. T. H. Lewis, Ltd., will be exhibiting two of their latest electrically assisted handcarts, one fitted with a body for milk delivery and the other for bread. The Metropolitan-Vickers Electrical Co., Ltd., will show two vehicles selected from its standard range. Partridge, Wilson & Co., Ltd., will be exhibiting their 8 cwt. carrying capacity light-weight vehicle and their 12/14 cwt. "Bulldog" type van. In addition to the above, there will also be an exhibit of chargers and battery parts.

Modern Office Lighting

An attractive scheme of lighting has been incorporated in the entrance hall and portico of Hobart House, Grosvenor Place, London, S.W.1. In the main hall a laylight 16 ft. 6 in. by 10 ft. 6 in. is the sole source of illumination, but with very



A G.V.D. lighting installation at Hobart House.

few lamps even lighting is provided over the large area of glass and floor. The beauty of the decorative glazing in the laylight is seen to the best advantage owing to the absence of "spottiness" usually unavoidable with this form of lighting. There are three laylights set in the soffit of the portico, one 9 ft. by 4 ft. and the other two 4 ft. by 4 ft. Only nine lamps are used in the three laylights to provide perfectly even lighting. The scheme was planned and carried out by G.V.D. Illuminators, Ltd., in collaboration with Haskins & Co., Ltd., the manufacturers of the laylights.

Neon Sign Dispute

Our attention has been called to the report of the case of Stuart Vernon, Ltd., *v.* Electrolumination, Ltd., on page 428 of our issue of March 24th. We are informed by the solicitors for Electrolumination, Ltd., that it was admitted at the trial by Stuart Vernon, Ltd., that the cost of running the sign as originally contemplated would have been approximately 3s. 3d. a week, and the higher figure mentioned in the report was due to the fact that objections from the railway company had to be studied and the sign was carried out in another colour. We are also informed that no allegation was made that the sign as altered was practically useless. Upon these facts Lord Justice Finlay came to the conclusion that the plaintiff's action must fail.

Strowger Works Extension

An important advance in the Government's plans for increasing aircraft production took place on April 3rd when the foundation stone of a large new extension to the Strowger Works (Liverpool) of the Automatic Telephone & Electric Co., Ltd., was laid by the Secretary of State for Air, Sir Kingsley Wood, M.P., in the presence of the Lord Mayor of Liverpool (Ald. Sir Sydney Jones), the Earl of Derby, and a number of distinguished guests. The extension consists of a large four-storey building which is being constructed exclusively to handle Air Ministry contracts. The building is, in fact, almost completed, so that Sir Kingsley's act of laying the foundation stone really symbolises the placing into the nation's service of the huge new workshops. Upon his arrival at the works Sir Kingsley Wood was received by Sir Alexander Roger, chairman of the Automatic Telephone & Electric Co., Ltd., Mr. T. A. Eades, managing director, Mr. F. C. Burstall, commercial director, and Mr. A. F. Bennett, manager and local director. Before proceeding to the new extension Sir Kingsley visited the assembly departments where he saw employees working on contracts for automatic telephone equipment, street fire alarm apparatus, "Rythmatic" control for street lighting and other public services, and other light-current signalling products. Sir Kingsley was informed by Sir Alexander Roger that an important contract for the supply of automatic telephone equipment to the Portuguese Government had been placed with the company, and he introduced to Sir Kingsley the engineer, Senor Rodrigues, technicians and mechanics who are at present resident at the Strowger Works for the purpose of obtaining complete technical knowledge of the equipment.

Slough Electrical Association

The inaugural meeting of the Slough & District Electrical Association was held on April 4th at the Crown Hotel, Slough. Mr. E. P. Page, the hon. director and secretary, in explaining the objects of the Association, said that the idea grew out of a meeting he had organised on behalf of the Sun Electrical Co. in January, after which he was asked by a number of people connected with the electrical industry to promote an electrical association in the district. The Advisory Committee was composed of Messrs. W. G. Bedford, C. E. Landymore, R. E. Cave, C. L. Morgan, W. J. S. Wellard, G. H. Rayner, W. Terry and F. Brassington. The fact that they had been able to start off with 150 members before the inaugural meeting promised well for the future. All branches of the electrical industry were represented. Two lectures were given during the evening, one by Mr. R. H. Young on "Ventilation," and the other by Mr. Hatto on "Electric Tools."

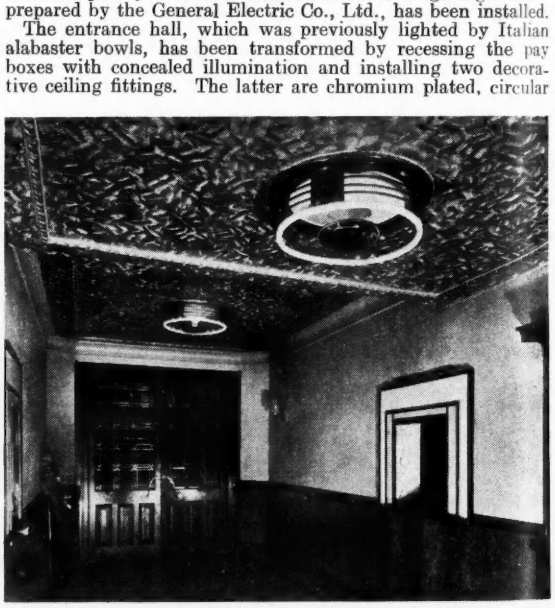
Noise Elimination

A special course on "Noise; Its Measurement and Elimination," will be given by Mr. S. N. Ray at the Borough Polytechnic, London, S.E.1, on Wednesday evenings, commencing on May 10th.

Sheffield Cinema Lighting

A striking example of the part which up-to-date lighting can play in modernising a building is provided by an installation which has just been carried out in a 25-year-old cinema at Sheffield. The Unity Picture Palace, Langsett Road, has been completely redecorated and an attractive lighting scheme prepared by the General Electric Co., Ltd., has been installed.

The entrance hall, which was previously lighted by Italian alabaster bowls, has been transformed by recessing the pay boxes with concealed illumination and installing two decorative ceiling fittings. The latter are chromium plated, circular



New fittings at the Unity Picture Palace

in shape, with a series of red rings surmounted by four quarter-circle "Osram" architectural lamps forming a hoop; the central feature consists of a cream trumpet illuminated from a chromium pan in which are four 25-W "Osram" candle lamps.

In the auditorium are six box pendants of special design.

These harmonise with the colour scheme, which is pale blue with copper-bronze relief. The fittings, 3 ft. square and 5 ft. overall, have brass metalwork finished in copper-bronze colour and are glazed with champagne flashed opal side panels and obscured reeded and blue morocco panels in the bottom. Each takes six 100-W lamps. There are obscured dust panels on the top, and the fittings are arranged so that they may be lowered for cleaning or adjustment. Dimmers are included in the circuit. The G.E.C. also supplied more than 400 ft. of tubular heating which runs below rows of seats on the ground floor. The electrical installation was carried out by Gallagher & Co. (Electricians), Ltd., of Sheffield.

Hereford Electrical Exhibition

An electrical exhibition, organised by the Shropshire, Worcestershire and Staffordshire Electrical Power Co. was held recently at the Shirehall, Hereford, and drew large crowds of people from the city and county to see the latest electrical apparatus, domestic, agricultural and commercial. The opening ceremony was performed by the Mayor of Hereford (Mr. H. P. Barnsley), who was accompanied by the Mayoress, Mr. T. B. Feltham (Town Clerk) and Mrs. Feltham, Ald. F. W. Allcock (Deputy-Mayor), Mr. G. W. Abbott (commercial manager of the S.W.S. Co.), Mr. G. D. Coe (divisional manager) and Mr. G. H. H. Watson (district representative). The Mayor said that the Corporation Department commenced electrical operations in 1900, and in 1929, when the undertaking was transferred to the Shropshire Power Co. the total number of consumers was 1,902, of whom 300 were in the county and outside the city boundaries. A rural development scheme was started after the war. The porch of the Hall was devoted to the farming section, where there was a wide range of apparatus, from milking machines and automatic water boilers to horse-clippers, sheep-shearing machines, and numerous small motors for use on the farm. In the corridor of the hall an attractive display was provided by the window-dressing competition, entered for by three well-known Hereford firms, and which, incidentally, demonstrated modern window lighting. The Assembly Room itself had a representative display of domestic electrical appliances

A group at the opening of the S.W.S. Electric Power Co.'s exhibition at Hereford, including the Mayor and Mayoress, the Town Clerk, and officials of the company

American Domestic Appliance Exports

Official trade returns show that there was a decline last year in the overseas demand for American domestic electrical appliances, the gross value of the shipments from the United States having attained a total of £3,424,562 as compared with £3,773,702 in 1937. The appended table gives the details of the exports during the past two years:—

	1937		1938	
	No.	Value £	No.	Value £
Electric fans	128,138	124,581	119,666	129,079
Elec. household refrigerators...	168,021	2,554,263	141,012	2,153,558
Elec. washing machines ...	56,291	420,112	66,417	525,923
Washing machine parts ...	—	26,343	—	34,181
Elec. irons	199,222	68,420	175,336	64,791
Elec. cooking ranges	6,807	79,988	6,154	69,455
Elec. domestic vacuum cleaners	27,990	105,879	29,776	111,724
Vacuum cleaner parts ...	—	69,488	—	56,836
Domestic electric heaters and ovens	28,438	32,709	25,330	32,171
Other domestic elec. apparatus and parts	—	291,919	—	246,844
Totals	—	£3,773,702	—	£3,424,562

The stand of the County of London Electric Supply Co., Ltd., at the recent Mitcham Industries Fair

Mining Reference Book

The Secretary for Mines announces the publication of the 1939 edition of the reference book entitled "Coal Mines Act, 1911: Regulations and Orders relating to Safety and Health" (H.M. Stationery Office, price 1s. 10d. post free). In this volume the Regulations and Orders of a general nature which were in force on January 20th, 1939, are collected together in convenient form for the use of mine officials, students and others concerned with safety and health in mines. The new edition also includes a number of Orders made during 1938 which came into force on March 1st, 1939.

Safety lamps; bulbs for electric safety lamps; glasses for flame safety lamps; other electric lighting apparatus; electric signalling and telephone apparatus; electrical shot-firing apparatus; firedamp detectors; breathing apparatus and smoke helmets, must be of a type which has received statutory approval, and lists of the approved types, together with the names and addresses of the manufacturers, are given in the book. There are also lists of permitted explosives and blasting cartridges.

Firedamp Detectors

A circular (No. 122) issued by the Mines Department states that the new Regulations (Statutory Rules and Orders, 1939, No. 322) relating to the use of firedamp detectors, became applicable as from April 1st in place of the Regulations of 1935, except the section requiring the provision of automatic detectors, which will not become operative until January 1st, 1940. The temporarily excluded section relates to the use of automatic connectors in safety-lamp seams in connection with electric motors.

Another M.D. circular (No. 123) introduces four Firedamp Detectors Orders, 1939. No. 1 states the general conditions of approval of flame safety hand-lamps as detectors. Nos. 2, 3 and 4 set out the conditions of approval and describe the construction of the Ringrose automatic firedamp alarm, the Ringrose Miner's lamp type CH4, and the Thornton firedamp detector; copies of these Orders must be posted in the lamp-room of every mine in which the type of electric detector in question is provided.

The circulars and Orders are obtainable from the Stationery Office at 1d. net each.

"Nesco" Year Book

The North-Eastern Electric Supply Co., Ltd., celebrates its golden jubilee this year, and its year book, which has just been issued, is a souvenir outlining the history of the company from its first power station at Pandon Dene to the existing modern stations at Dunston, Carville and North Tees. The year book also includes the balance sheet for 1938, together with a report of the proceedings at the annual meeting held on March 22nd. The portraits of the original directors in 1889 and of the present directors are reproduced, as also are those of the present officials of the company.

Trade Announcements

The Lorival Manufacturing Co. (1921), Ltd., has removed to Little Lever, near Bolton, Lancs (Telephone: Farnworth 644-5. Telegrams Lorival, Little Lever).

The Progress Electrical Co. has changed its name to Progress Cables & Accessories Co., Ltd., and has removed to Regent House, Eversholt Street, London, N.W.1 (telephone: Euston 5588-9).

Howard Graham, Ltd., Tiddington Road, Stratford-on-Avon, have been formed to acquire from Mr. H. Clayton-Wright his exclusive manufacturing and sales rights of the "Harris" range of bushings, and the "Torflex" coupling and sleeve bush.

The I.M.E.A. Convention

In addition to the I.M.E.A. Convention papers mentioned in our last issue there will be one by Councillor A. L. Boddington (Croydon) on "The Financial Aspects of Electricity Supply" to be read on the morning of June 7th.

A Water Heater Display Unit

The accompanying illustration shows the latest water heater display unit which has just been issued by Ferranti, Ltd. The display stand carries a 1½-gallon water heater fixed to a draped background. Water pours from a tap (suspended by a thin

A new Ferranti water heater display unit

wire) into a large inverted top hat; whilst to complete the magic scene a conjuror's table stands next to it. Hands, coloured and shaped in wire, are above the table. The display has already created considerable attention in Manchester showrooms during its recent appearance.

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances:—

CHEMICALS, ETC.	Price April 12th	Fortnight's inc. or dec.
a Acid Oxalic ... ... per cwt.	50s.	—
a Ammoniac, Sal ... ... per ton	£37	—
a Ammonia, Muriate (large crystal)... ,,	£18 10s.	—
a Borax... ... ... ,,	£17	—
a Copper, Sulphate ... ... ,,	£19	—
a Potash, Chlorate ... ... per lb.	3¾d. to 4¼d.	—
a ,, Perchlorate ... ... ,,	6d.	—
a Shellac ... ... per cwt.	£4 8s.	—
a Sulphur, Commercial ... ... per ton	£11	—
a ,, Roll ... ... ,,	£11	—
a Soda, Chlorate ... ... per lb.	3¼d. to 3¾d.	—
a ,, Crystals ... ... per ton	£5 to £5 5s.	—
a Sodium, Bichromate, casks ... per lb.	4¼d. net.	—
METALS, ETC.		
b Aluminium, Ingots ... ... per ton	£94	—
b ,, Wire ... ... per lb.	1/1 to 1/9	—
b ,, Sheet and Foil ... ,,	1/2½ to 2/9	—
p Babbits Metal and Anti-friction Metals—		
Grade I ... ... per ton net	£197	—
Grade II ... ... ,,	£137	—
Grade III ... ... ,,	£73	—
c Brass (rolled metal 2" to 12" basis)... per lb.	8¼d.	—
c ,, Tubes (solid drawn) ... ... ,,	11½d. to 11¾d.	—
c ,, Wire, basis ... ... ,,	8½d.	—
c Copper Tubes (solid drawn) ... ,,	1/0½d.	—
g ,, Bars (best selected) ... per ton	£80	—
g ,, Sheet... ... ... ,,		
g ,, Rod ... ... ,,		
d ,, (Electrolytic) Bars ... ... ,,	£49 5s.	—
d ,, ,, Wire Rods ... ,,	£54	—
d ,, ,, H.C. Wire ... per lb.	7⅛d.	—
f Ebonite Rod ⅛" dia. & up.... ... ,,	1/10 to 2/5	—
f ,, Sheet ⅛" thick & up ... ,,	1/5 to 1/10	—
n German Silver Wire, Nos. 1 to 12... ,,	2/4	—
h Gutta-percha, fine ... ... ,,	Nom.	—
h India-rubber, Para-fine ... ... ,,	7d.	½d. dec.
i Iron, Pig (Cleveland, No. 3) ... per ton	£4 15s.	—
i ,, Wire galv. No. 1 P.O. Qual.... ,,	£23	—
g Lead, English Pig ... ... ,,	£16	15s. dec.
g Mercury ... ... per bot.	£17	3s. 6d. inc.
e Mica (in original cases) small ... per lb.	10d. to 2/–	—
e ,, ,, ,, medium ... ,,	6/– to 12/6	—
e ,, ,, ,, large ... ,,	13/– to 17/6 up	—
p Phosphor Bronze, plain castings ... ,,	1/2½	—
p ,, ,, drawn bars & rods ,,	1/1d.	—
p ,, ,, rolled strip & sheet ,,	1/1½d.	—
p ,, ,, wire ... ... ,,	1/1¾d.	—
o Platinum ... ... per oz.	£7 10s.	—
d Silicum Bronze Wire ... ... per lb.	8⅜d.	—
g Spelter ... ... per ton	£13 5s.	8s. 9d. dec.
g Tin, Block (English) ... ... ,,	£214 5s.	£2 dec.
n ,, Wire, Nos. 1 to 16 ... ... per lb.	3/6	—

Quotations supplied by:—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India Rubber, Gutta Percha and Telegraph Works Co., Ltd.
g Henry Gardner & Co., Ltd.
h Edward Till & Co.
i Bolling & Lowe.
n P. Ormiston & Sons.
o Johnson Matthey & Co.
p C. Clifford & Sons, Ltd.

The above table is published here fortnightly. In alternate issues, in which it does not appear, the latest prices of copper, silicium bronze wire, lead, rubber, tin and spelter, up to the time of going to press, are given in this section under the same heading.

Electrical Works Strike

The unofficial strike of apparatus stores workers of Siemens Bros. & Co., Ltd., at Charlton, which commenced about three weeks ago, was extended on April 11th when about 3,000 other employees walked out as a protest against the discharge of Mr. C. T. Wellard, who had acted as secretary to the shop stewards' committee at the factory. The original dispute, affecting about eighty workpeople, arose over the discharge of one man who, the strikers alleged, had not been given a fair hearing by the company.

Japanese Electrical Industry

Investigations recently conducted by the Communications Ministry with regard to the production of electrical apparatus and supplies in Japan, including electric wire and electric lamps, reveal that the total production during the fiscal year from April, 1937, to March, 1938, reached a value of 401,714,000 yen (1 yen=1s. 2d.). Compared with the figures for 1928 there is an increase of about 60 per cent., and compared with those of 1931 and 1932, when the industry was in a bad state, the total has increased about three times. Below is a table showing the production for ten years from 1928 to 1937 inclusive, which indicates that during the world depression the industry met with a sharp decline. That trend, however, touched bottom in 1932, after which the industry improved steadily, keeping pace with the general recovery.

Years	In 1,000 yen: Electrical apparatus	Electric bulbs	Electric wire and cable
1928	125,395	26,817	109,742
1929	126,738	29,088	110,543
1930	106,840	23,216	73,725
1931	73,435	17,811	51,424
1932	76,310	15,577	49,281
1933	112,080	23,446	79,774
1934	123,553	24,128	69,468
1935	172,419	25,608	124,602
1936	201,298	21,958	165,306
1937	190,630	15,459	195,625

New Catalogues and Lists

Westinghouse Electric International Co., 2, Norfolk Street, W.C.2, is responsible for the distribution of the Westinghouse general catalogue mentioned in our issue of March 31st (p. 474).

Bakelite, Ltd., 40, Grosvenor Place, London, S.W.1.—A booklet entitled "The Material of Infinite Uses."

Associated Electric Vehicle Manufacturers, Ltd., 231/3, Grand Buildings, Trafalgar Square, London, W.C.2.—A pamphlet on "Morrison" lighting, maintenance and installation tower wagons.

Power Equipment Co., Ltd., Kingsbury Works, The Hyde, Hendon, London, N.W.9.—Publication No. 700 illustrating and describing faceplate pattern shunt regulators.

General Electric Co. Ltd., Magnet House, Kingsway, London, W.C.2.—A 62-page catalogue of ship-wiring cables; also a leaflet on "Osram" krypton-filled miner's lamp bulbs.

D. G. E. Barrie, 24, Middleton Avenue, Hove, 3.—A leaflet giving details of torpedo switches.

Wardle Engineering Co., Ltd., Old Trafford, Manchester, 16.—Catalogues dealing with "Maxheat" oval tubular electric heaters, "Workslite" reflectors, "Prismalux" directional lighting fittings, and industrial reflectors.

Time Switches & Instruments, Ltd., 120, Victoria Street, London, S.W.1.—Leaflets describing an earthing test instrument and small electromagnetic voltmeters and ammeters.

Bankruptcy Proceedings

J. W. Watson, 154, Aldborough Road, Seven Kings, electrical engineer.—This debtor's public examination was held on April 5th at the Shire Hall, Chelmsford, when it was reported that the liabilities amounted to £1,921 and the deficiency to £1,893. Debtor stated that he commenced business in September, 1926, and traded successfully until 1931. He entered into partnership with another in June, 1932, at which time debtor's deficiency amounted to £400, while his partner's accounts showed a surplus of £200. After a dissolution took place, debtor continued trading, but the deficiency increased. The hearing was adjourned.

H. W. Blythe, 64, High Street, Bognor Regis, radio dealer.—The receiving order was made on the debtor's own petition recently, and he has filed a statement of affairs showing gross liabilities of £1,787 and net assets of £315, leaving a deficiency of £1,238. Debtor attributes his failure to lack of capital, bad trade and bad debts.

H. V. Sore, Electra House, Sun Street, Hitchin, electrical engineer.—The public examination herein was held at the Court House, Luton, recently. Debtor had returned a statement of affairs showing unsecured liabilities of £1,274, and net assets of £337, leaving a deficiency of £937. Debtor attributed his failure to commencing the business without capital; heavy personal drawings, working on too low a profit, and falling off of trade. The examination was adjourned for closing.

D. O. Rogers, 29, Hillside Road, Meadowville Estate, Holway, Holywell, and 1, East Parade, Rhyl, wireless dealer.—This debtor's public examination took place at the Court House, Bangor, on March 31st, and was closed. His gross liabilities were £329, and there was a deficiency of £291. Debtor said his failure was due to developing the hire-purchase side of his business.

S. Garfinkel, radio dealer, 23, New Street, London, W.C.2.—Receiving order made March 31st on a creditor's petition.

G. A. Wood, electrical engineer, 129, Bolton Road, Darwen.—Public examination, May 3rd, at the County Court House, Blackburn.

G. Murray, radio dealer, 30, Elmstead Avenue, West Chislehurst, lately carrying on business at 119, High Street, Orpington.—Public examination, April 24th, at the Court House, Rochester.

C. J. C. Etchells, electrical and radio dealer, 8, Jedburgh Street, Middlesbrough.—Trustee, Mr. C. L. Townsend, 80, High Street, Stockton-on-Tees, Official Receiver, released March 30th.

C. W. Watson, electrical and wireless engineer, 33, Rainhall Road, Barnoldswick, Yorks.—Supplemental dividend of 6s. 0½d. in the £, payable April 13th, at 71, Manningham Lane, Bradford.

R. Bamforth, electrical engineer, 10, West Street, Hoyland, near Barnsley.—Receiving order made April 5th on debtor's own petition.

F. W. Scott, radio and electrical dealer, 106, Leeds Road, Outwood, near Wakefield.—Receiving order made April 3rd on debtor's own petition.

H. A. Langlois (Electrical Installation Co., and/or Electrical Contracting Co.), 2, Atlas Place, Cardiff; 22, Pocklington's Walk, Leicester; 94, Rutland Street, Leicester; and Gartree Street, Leicester.—Application for discharge to be heard on May 1st at the Law Courts, Cardiff.

H. A. Simpson and **E. Dyson** (Simpsons), radio and electrical engineers, 18, Eastbank Street, Southport.—Trustee, Mr. W. G. Lithgow, 413, Lord Street, Southport, released March 29th.

Company Liquidations

Radiometers, Ltd., radio dealers and electrical engineers, Eagle House, Jermyn Street, S.W.—The Official Receiver reports that the statement of affairs shows liabilities £2,653 against assets nil. He states that the company was formed in August, 1935, and the issued capital was £604. The company acquired a business carried on at Harpenden Road, West Norwood. In the early stages, radiometers were made by a manufacturing company to the company's design and were sold mainly to dealers and wholesalers. In addition, the company subsequently manufactured AC and DC multimeters, combined resistance and capacity testers, valve tester adaptors and valve analysers. A service department was carried on unsuccessfully for some time and the directors eventually disposed of it. In 1937 and 1938 there was a considerable drop in sales owing to severe competition and a falling off in demand as the sale of radiometers was limited and saturation point was being reached. Very little business was done after January, 1938. The failure was attributed to lack of capital, loss of moneys expended on development, heavy selling expenses and considerable decline in trade. As a result of recent meetings of creditors the Official Receiver remains liquidator of the company.

B. & F. Carter & Co., Ltd.—Meeting, May 2nd, at Albion Works, Waterloo Street, Bolton, to receive an account of the winding-up by the liquidator, Mr. H. Bamford.

Western Lamps, Ltd.—Meeting, May 9th, at 14, Aldgate, London, E.C.3, to receive an account of the winding-up by the liquidator, Mr. P. J. Marriage.

Mitchell Electric Co., Ltd.—Winding up voluntarily. Liquidator, Mr. W. Le'Resche Hand, 17, Cannon Street, Birmingham.

G. P. Cosway, Ltd.—Winding up voluntarily. Liquidator, Mr. C. A. Hazeltine, 138, Manor Court Road, Nuneaton. Particulars of claims by May 1st to Mr. F. E. Bendall, King Edward House, New Street, Birmingham, one of the liquidators.

Information Department

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, &c., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the following:—

ULTRA-RAPID vacuum cleaner.

NISEN rubber neck fitting.

Sub-station Switchgear

Bakelised-paper Condenser Bushings

THE Shifnal sub-station of the West Midlands Joint Electricity Authority affords supplies in bulk at 11 kV to the Newport and Worfield districts. The incoming supply from the Ironbridge station at 33 kV is controlled by the switchgear made by the General Electric Co., Ltd., comprising four metal-clad units with a rated breaking capacity of 500,000 kVA.

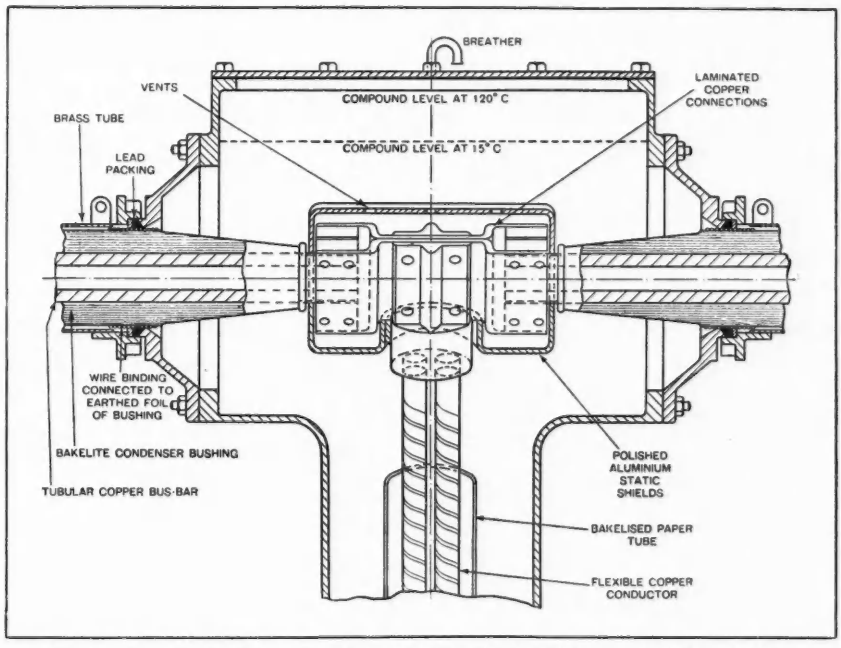
A feature of this type of switchgear is the absence of compound-filled bus-bar chambers, which are replaced by bakelised-paper condenser bushings which extend from the compound-filled tee joint chamber on one unit to similar chambers on adjacent units, and are enclosed in metal tubes to protect their surface. This reduction of compound effects a considerable saving in weight and, moreover, due to the ease with which the heat generated can be dissipated, a larger ampere capacity is possible for a given temperature rise than was obtainable with older forms of metal-clad switchgear which incorporated compound-filled bus-bar chambers of considerably greater dimensions.

The section of the bushing which passes into the joint of the tee chamber is bound with wire and is in metallic contact with the earth foil of the bushing. This enables the outer sheath of the bushing to be earthed, and at the same time permits a compound-tight joint to be made by means of a stuffing gland packed with special yarn. The use of this form of joint, in addition to making a seal, ensures the flexibility necessary to take up any longitudinal movement of the bus-bar due to expansion and contraction. A compound-filled tee joint chamber is embodied to enable the connection to be made between the spout insulator carrying the isolating sockets and the bus-bar itself. Owing to the rounded form of the conductors and the use of correctly shaped static shields, it is possible to obtain an even voltage gradient and uniform low stress throughout the tee joint chamber.

A feature of the insulation of condenser type bus-bars is the readiness with which it is possible to determine the electrical efficiency of the insulation by subjecting it to a power factor test using a Schering bridge, which method could only be applied with extreme difficulty to compound-filled bus-bar chambers. Each circuit-breaker is fitted with a side-blast type of arc control pot and is electrically operated by means of a solenoid.

One complete unit, including circuit-breaker, bus-bar, and current transformers, was subjected to a full series of tests in accordance with B.S.S. No. 116 (1937) in the G.E.C. high-power testing station at Witton. These tests included a cycle at a rating of 20 per cent. in excess of the nominal rating of 500,000 kVA at 33 kV.

The current transformers are housed in oil-filled chambers at the rear of the bus-bars, and are so mounted that it is only necessary to disconnect one clamp to enable them to be removed from their housings.



Section through tee joint chamber of 33-kV, 500,000 kVA metal-clad switchgear

ELECTRICITY SUPPLY

Public Lighting Conversion at Accrington. Blackburn Council Urged to Adopt Electric Lighting. Commissioners Oppose Nuneaton Plant Extensions. Proposed New Yorkshire Power Station.

Abertillery.—New High-voltage Line.—The South Wales Power Co. proposes to erect an 11,000-V overhead line from Blaina to Abertillery.

Accrington.—Street Lighting Conversion.—The scheme for converting the street lighting from gas to electricity is practically complete. Attention is now being given to the lighting of the rural areas.

Barnard Castle. — Rural Supplies. — The North-Eastern Electric Supply Co., Ltd., has submitted estimates of the cost of supplying electricity to Lynesack and Softley to the Rural District Council.

Berwick.—Overhead Line.—The Town Council has approved plans by the Scottish Southern Electric Supply Co., Ltd., for an overhead line in Etal Road, Tweedmouth.

Birkenhead. — Additional Grid Connection. — The Electricity Committee is to alter the 6.6-kV switchboard in connection with the proposed provision by the Central Electricity Board of an additional feed to Birkenhead by means of the Wirral 132-kV line. Including the provision of automatic fire prevention apparatus and the reconstruction of floors and partition walls, the expenditure will be £17,540.

Blackburn.—Street Lighting.—At a meeting last week Councillor Eddie strongly recommended the illumination of all main and secondary roads by electricity. He declared that it was a mistake to introduce gas because he was convinced that in a few years' time they would find it necessary to change.

Blackpool. — Electricity Finance. — Alderman J. Potter, chairman of the Finance Committee, in presenting the municipal budget at the Town Council meeting on April 5th, said that the fall in electricity surplus from £64,000 to £45,000 was due chiefly to reductions in tariffs, accounting for £13,000. The rate relief from electricity surpluses since 1930 had been restricted to between £10,000 and £12,000. The department was now well furnished with reserve funds despite annual reductions in tariffs.

Bolton.—Power Station Extensions.—The Electricity Committee is seeking sanction to borrow £354,327 for extensions at the Back-o'-th'-Bank generating station.

Bridgend.—Suggested Joint Board.—At a conference last week between the Lighting Committee of the Bridgend Urban District Council and the Penybont Rural District Council the advisability of having a joint electricity board to represent the two councils, or an amalgamation of local authority electricity undertakings in Mid-Glamorgan, was discussed. Fear was expressed that the undertakings would be taken over by the South Wales Electric Power Co. A further meeting is to be called.

Colchester.—Revised Charges.—Owing chiefly to the continued rise in the cost of coal the Electricity Supply Department estimates that it will probably have to face a deficit this year amounting to £6,000, and to meet this it has revised its tariffs as follows:—Lighting flat rate: Reduction to 4½d. after first 50 kWh per quarter to be discontinued. Domestic tariff: Reduction to ½d. after first 500 kWh per quarter to be discontinued. Meter rents: Present rent of 1s. per quarter to be increased to 1s. 6d. per quarter. Water heating: Rent of special meters at present installed without charge to be 1s. 6d. per quarter. The revisions recommended are designed to produce an additional income of £10,500 in 1939-40 and are to be put into force as from the next meter readings.

Extensions.—Supplies are to be made available in case of emergency to the pumping stations of the South Essex Waterworks Co. at Abberton and Layer-de-la-Haye. The company is to bear the cost of service cables, estimated at £271.

Dover.—Bulk Supplies.—The Electricity Committee has recommended the approval of special terms for supplies in bulk to the Dover Engineering Works, Ltd., for its Dour Iron Foundry, and to Crow, Catchpole & Co., Ltd., Esplanade Quay.

East Grinstead.—Lighting Extension.—The Urban District Council has approved an extension of the new lighting scheme as far as Lingfield Road, at an estimated cost of £135.

Finchley.—Loan.—Application is being made by the Town Council for sanction to a loan of £34,000 to improve the electricity undertaking. The work contemplated includes conversion from DC to AC.

Flintshire.—Rural Supplies.—A resolution to headquarters asking that the question of rural electricity supplies should be dealt with on a national basis was passed at a meeting of the Flintshire County Branch of the National Farmers' Union held at Mold last week.

Guildford.—Mains.—The Electricity Committee is to extend the mains to various estates at a cost of £5,607.

Hastings.—Supply to New Works.—The Electricity Committee has arranged terms for affording a supply to the new works of the Fairlight Mining Co., Ltd., at Fairlight and Doleham.

Herne Bay.—Mains.—The Herne Bay & District Electricity Supply Co., Ltd., proposes to lay mains in Lismore Road and in the Herne Bay-Canterbury Road.

Hull.—Extensions.—The Electricity Committee is to extend the mains at a cost of £16,092 and is seeking sanction to borrow £50,000 for sub-stations and £25,000 assisted wiring.

Ilford.—Loan.—The Electricity Committee is seeking sanction to borrow £19,894 for feeders, sub-stations, transformers, &c.

Cooling Equipment.—Water cooling apparatus is to be installed at the town hall sub-station at a cost of £826.

Liverpool.—Cooker Hire.—A concession to hirers of cookers occupying municipal houses has been decided upon by the Electric Power & Lighting Committee. Where tenants elect to pay the hire charges for an electric cooker weekly, the charge for a standard type of cooker will be 5d. per week, plus an extra 1d. per week for cookers with thermostats.

Nelson.—Increased Fixed Charge.—The Town Council has increased the fixed charge on the rateable value tariff from 15 to 16⅔ per cent. To the majority of consumers on this tariff the increased cost will be one penny per week.

Northern Ireland.—New Electrical Plant at Portstewart.—The power station which serves the small statutory electricity undertaking of the Portstewart Urban District Council, on the coast of Co. Londonderry, is to have its capacity increased to 340 kW by the installation of an additional 160-BHP Blackstone engine direct-coupled to a G.E.C. 100-kW DC generator. The undertaking, of which the manager is Mr. J. McMullan, was purchased by the Council from a company in 1926, when the present power station was built. The plant taken over included a 12-kW G.E.C. generator direct-coupled to a Blackstone horizontal Diesel engine, which are still giving economic and reliable service. A 54-kW set made by the same concerns was added, and in 1936 a 100-kW set was installed, the distribution system being reorganised at the same time at a cost of £6,000. Last year the number of consumers was nearly 1,000 and the maximum demand 192 kW, the population served being about 2,500. The flat rate for lighting is 6d. per kWh and for power 1½d. per kWh.

Nuneaton.—Additional Plant.—The need for additional generating plant was discussed at a recent meeting of the Town Council. The Electricity Commissioners have intimated that they are not in favour of the addition, but the electrical engineer is to make further representations.

Oldbury.—Discharge Lighting.—The Corporation is to provide a system of high-pressure electric-discharge lighting along the Birmingham-Wolverhampton Road between Hagley Road West and Birchfield Lane.

Peterborough. — Concession to Domestic Consumers. — Charges to domestic consumers outside the city boundary on both the fixed and kWh bases are to be reduced by 10 per cent.

Extension.—Mains are to be laid to the Edwalton estate at estimated cost of £170. An annual income of £130 is anticipated when all the houses on the estate are completed.

Lighting Installation.—A new lighting system costing £243 is to be installed on the Crescent Bridge.

St. Helens.—Rate Contribution.—The Electricity Committee has resolved that a sum equivalent to 1½ per cent. of the outstanding debt of the undertaking shall be contributed out of the profits of the undertaking for 1938-39 in aid of the rates.

Scunthorpe.—Apparatus for Hire.—Application is to be made to the Electricity Commissioners for sanction to a further £5,000 loan for the purchase of apparatus for hire.

New Feeder.—An additional feeder is to be provided from the kiosk in Old Crosby along Diana Street, Burke Street, Mulgrave Street and Grosvenor Street, at estimated cost of £325.

South Shields.—Hospital Installation.—The Town Council is applying for sanction to borrow £1,220 for the electrical installation in a new maternity hospital.

Spenborough. — New Switchgear. — The Urban District Council is to make application to the Commissioners for consent to a loan of £7,000 for work involved in replacing switchgear, and £2,500 for reinforcing the supply, in connection with improvements to the electricity undertaking. The Yorkshire Electric Power Co. has agreed to reinforce its bulk supply system and to install a modern switchboard at the electricity works to replace existing apparatus.

Todmorden.—Overhead Lines.—The Rural District Council is raising no objection to the proposal of the Electrical Distribution of Yorkshire, Ltd., to erect overhead lines at Hepton-

stall, and also from the Lodge, Midgehole, to the Halifax Corporation filter house a Hollin Hall.

Tunbridge Wells.—VAPOUR FROM COOLING TOWER.—Following further complaints that vapour which issues from a cooling tower in Western Road is a nuisance, the Tunbridge Wells Lighting Comittee has instructed the borough electrical engineer and a member of the Committee to visit the Acton Lane Works, Harlesden, to inspect the hyperbolic cooling tower there.

Weston-super-Mare.—ILLUMINATIONS.—A scheme of sea-front illuminations to cost £1,000 prepared by the borough surveyor has been referred to the Finance Committee for consideration.

Yorkshire.—NEW POWER STATION.—A new power station to cost about £1,000,000 is to be built at Mexborough by the Yorkshire Electric Power Co., which is to proceed immediately with plans for its construction.

Overseas

Australia.—TENDERS FOR ELECTRICAL EQUIPMENT.—Out of twenty-three tenders for 33-kV armoured cable the Sydney County Council was recently recommended to accept that of Herbert del Cott Pty., Ltd., at £23,218, for cable manufactured by Allgemeine Elektricitäts Gesellschaft, Berlin. After allowing for preferences, this was £6,679 less than the next lowest tender, for cable manufactured in Great Britain. The Council, however, deferred its decision pending the receipt of further advice, states the *Electrical Engineer and Merchandiser* (Australia). A few months ago the Victorian Railway Commissioners were recommended to accept a German tender for a 30,000-kW turbo-alternator for their Newport power station, but the State Cabinet decided that fresh tenders should be invited, and these closed recently.

INSPECTION OF INSTALLATIONS.—In accordance with new regulations which came into force at the beginning of the year the Sydney County Council is carrying out an inspection of the electrical installations of its 30,000 consumers during the next five years, for which purpose the staff of inspectors has been increased from eleven to twenty.

POWER STATION INTERLINKING.—A sub-committee of the New South Wales Electricity Advisory Committee is to report on the interlinking of major power stations. In a report to the Sydney County Council recently Mr. Forbes Mackay, the general manager, enumerated the advantages of interconnecting the supply networks of the Council, the Railways Department, and the Electric Light & Power Supply Corporation. The aggregate capital invested in spare plant for the three undertakings, he said, was between £3,000,000 and £4,000,000.

BUNNERONG CHIMNEY AND WAR DANGER.—The Australian Naval Board has informed the Sydney County Council that the new 300-ft. chimney at the Bunnerong power station is an excellent range-finding mark and as such would be a definite source of danger to Sydney in general and the power station in particular in war time.

RURAL SUPPLIES.—The Brisbane City Council has asked the manager of the Electricity Department to formulate a policy for the provision of supplies to rural areas in Greater Brisbane over a period of years.

India.—MADRAS.—Our Bombay correspondent reports that the Madras Government has sanctioned an expenditure of Rs.22,00,000 on electricity projects in 1939-40. Hydro-electric schemes in the Andhra districts are being examined. In future all production and distribution of energy will be undertaken by the Government.

TRACTION

Cardiff.—TRANSPORT POLICY.—When the City Council met last week Ald. F. H. Turnbull moved the adoption of the Finance Committee minutes, which included the city treasurer's report in favour of trolley-buses. Ald. H. Johns, chairman of the Transport Committee, objected. He said that the transport manager and the city treasurer had agreed to meet to see if their reports could not be brought more in agreement. The two officers failed to reach agreement, but instead of the city treasurer taking his report to the Transport Committee he had laid it before the Finance Committee. Ald. Johns submitted that this course was out of order, and was upheld by the town clerk. Mr. G. Baden Smith, who supported the attitude of the Finance Committee, said he was tired of the delay over the form of transport which was to take the place of trams. It was a matter that had had the consideration of the Transport Committee for nearly two years and there had been reports from nearly every official. Although the city treasurer's report was received last September it had not been considered by the Transport Committee. On the motion of Alderman Sir Illtyd Thomas it was decided that the report of the treasurer should be received and be sent to the Transport Committee and the General Purposes Committee for early consideration.

Eire.—CHANGE TO BUSES CRITICISED.—During the debate in the Dail on the estimate for the Department of Industry and Commerce, Mr. Benson said he thought that in the event of war the rationing of oil would be more severe than it was in the last war. He wished to know whether the Department considered it in the national interest that public transport in Dublin should be changed from the use of home-produced fuel (electricity) to the use of an imported fuel. It had been shown by the Electricity Supply Board that the Tramways Company took 10 per cent. of its total output of electricity, and if the present policy were continued the result would be that the Board would lose that 10 per cent. and the necessary imports of petrol would be considerably increased, resulting among other things in the raising of the adverse balance. There were many arguments for and against trolley-buses as compared with motor-buses, but the question was whether it was in the national interest that the change-over should take place. The Minister, Mr. Benson continued, might say that he had no power to deal with such a matter, but if he felt that the matter was important there would be no difficulty in getting the necessary powers to control that development. The Minister might also consider whether any further concession could be made to help the use of battery-driven electric vehicles.

London.—SUGGESTED TUBE EXTENSION.—The London Passenger Transport Board has informed the Southwark Borough Council that the matter of tube facilities in Camberwell will be borne in mind, and that as soon as the financial position of the Board and the main line railways permits the proposal for a tube extension to the area will again receive consideration.

Newcastle-on-Tyne.—TROLLEY-BUSES.—A further six trolley-buses are to be purchased by the Transport and Electricity Committee in addition to the six for which tenders were invited recently. The Council is also to purchase from Transport Vehicles (Daimler), Ltd., Coventry, at a cost of £2,683, a demonstration trolley-bus which has been operating in the city for the past year. Trolley-buses are to be introduced on the Elswick Road route in place of tramcars. The next change-over is from Throckley to Forest Hall, which will cost about £120,000. The Elswick Road change-over will cost £50,000.

COMMUNICATIONS

Ceylon.—NEW AUTOMATIC TELEPHONE SYSTEM.—On Good Friday a new 10,000-line automatic telephone system was put into service in Colombo. The system, which employs all the latest connecting and testing circuits as approved by the British General Post Office, was manufactured and installed by Standard Telephones and Cables, Ltd., for the Department of Posts and Telegraphs, Ceylon. The complete layout consists of three exchanges—Colombo Central, Havelock Town and Maradena—with full dialling facilities available between all subscribers. One number has been reserved for a "TIM" speaking clock service. The power plant consists of the following material at all three exchanges:—Two main batteries, one motor battery, two motor-generators for charging the main batteries, one battery ringing machine and one mains driven ringing machine. The battery at the Central Exchange is the largest ever installed in Ceylon, taking 2,500 gallons of diluted acid. The motor generators are of the enclosed ventilated type, the motors being suitable for 400 V, three phase, 50 cycles, AC supply.

Great Britain.—NATIONAL TELEVISION SYSTEM.—Speaking at Liverpool last week Mr. F. W. Ogilvie, Director-General of the British Broadcasting Corporation, said that they had now come to a critical landmark in television after two years' hard work. They wanted to take further steps to make television a national system at the earliest opportunity. The speed at which they could go forward depended first on the result of technical experience as to the means of transmission—it was hoped that these results would be known before very long, although not this year—and, secondly, on finance.

Writing in *The Times* last week Lord Hirst said that the key point in television at the moment was its extension to at least one provincial centre. The experiments which had for months been proceeding under Post Office auspices to test the rival merits of wired and wireless transmissions between one centre and another should be completed with the utmost dispatch, and immediately the verdict was given a programme-distributing centre should be established in Birmingham, and as soon as possible thereafter in at least two other great provincial centres. Once the service had been extended the industry would reap the advantage of mass production as well as of research into problems which must at present remain theoretical. It would then be more admirably equipped than any of its rivals to win overseas markets, both Empire and foreign. A very moderate sum was needed and could probably be provided by the transfer to the B.B.C. of that part of the wireless licence revenue which the Government still retained for its own purposes; if not, the Government might well allocate for this special purpose some small fraction of the £15,000,000 which it had received from the licence revenue during the last 16 years.

On April 6th, Dr. E. Mallett, principal of Woolwich Polytechnic, wrote supporting Lord Hirst's appeal. As one who before the event gave considerable publicity through a Faraday Lecture to his doubts about the entertainment possibilities of television he wished to say that these doubts had been completely dispelled. The extension of the service throughout the country appeared to be essential on grounds of equity, and the cost would not be as great as was commonly supposed.

FINANCIAL SECTION

New Companies. Official Returns of Capital. Debenture Charges. Reports of Electrical Companies. Dividend Announcements. Transactions in Stocks and Shares

New Companies Registered

F. C. Heayberd & Co., Ltd.—Private company. Registered April 1st. Capital, £10,000. Objects: To carry on the business of electrical equipment specialists, manufacturers and repairers of and dealers in rectifier equipment, transformers, resistances, welding plant, batteries, &c. F. C. Heayberd, 148, Ravensbourne Avenue, Shortlands, Kent, is first and permanent governing director. Secretary: R. G. Lathey. Registered office: 10, Finsbury Street, E.C.2.

Noma Electric Co., Ltd.—Private company. Registered March 31st. Capital, £10,000. Objects: To carry on the business of manufacturers of and dealers in decorative lighting products of all kinds, illuminated signs, lamps, tubes and other apparatus for electric or other lighting, &c. Directors: J. A. Proctor (permanent chairman), L. Szel, E. D. Tempest Vane, J. F. Stewart, addresses not stated, and R. Wordsworth, 39, Lombard Street, E.C. Solicitors: Wordsworth Marr Johnson & Shaw, 39, Lombard Street, E.C.

Mason Household Appliances, Ltd.—Private company. Registered March 31st. Capital, £1,000. Objects: To carry on the business of manufacturers and repairers of and dealers in artificial lighting apparatus, electrical and gas plant, machinery and accessories, wireless and television sets, refrigerators, washing machines and vacuum cleaners; financiers of hire-purchase agreements and transactions, &c. Directors: A. W. and G. A. Mason, 7, Park Avenue, Skipton, and W. M. Mason, "Raikeswood House," Raikes Road, Skipton. Solicitors: Charlesworth Wood & Brown, Bank Buildings, Skipton.

Batteries, Ltd.—Private company. Registered March 31st. Capital, £100. Objects: To carry on the business of electrical engineers and contractors, manufacturers of and dealers in electric batteries, accumulators, dynamos, &c. Directors: M. Dybeck, High House, Crabbs Cross, Redditch, Worcs, and V. Sharp, Lingwood, Crabbs Cross, Redditch, Worcs. Registered office: Hunt End Works, Crabbs Cross, Redditch, Worcs.

A. S. White & Sons, Ltd.—Private company. Registered March 31st. Capital, £2,500. Objects: To carry on the business of manufacturers of, agents for, and dealers in wireless and television sets, accessories and apparatus, artificial lighting apparatus, electrical fittings, &c. Directors: A. B. White, 45, Woodfield Way, New Southgate, N.11, and S. T. White, 39, Madeira Road, Palmer's Green, N.13.

Electric Movement and Engineering Co., Ltd.—Private company. Registered March 30th. Capital, £500. Objects: To carry on the business of electrical engineers, machinists, manufacturers and patentees, makers of electric clocks, time switches and electrical appliances, &c. Directors: E. F. Jessup, Overdale, Langley Avenue, Surbiton; R. J. G. Rolfe, Brooklyn House, Hemel Hempstead, Herts; and R. Wiseman, 63, Westbourne Park Road, W.2. Registered office: 37, Bedford Row, W.C.1.

Associated Signs, Ltd.—Private company. Registered April 3rd. Capital, £200. Objects: To carry on the business of manufacturers, erectors and maintainers of luminous tube, daylight, box, metal, electric and other signs, sign makers, fixers, advertising specialists, electrical engineers and contractors, &c. J. T. Sorthine, 15, Whitecross Avenue, Bristol, 4, is the first director. Registered office: 85, Victoria Street, Bristol.

Auto Electric Service Co. (Surrey), Ltd.—Private company. Registered March 31st. Capital, £500. Objects: To carry on the business of automobile and general electrical engineers, aeronautical, radio and television engineers, &c. Directors: G. E. Taylor and Mrs. D. Taylor, both of 18, Grasmere Road, Purley, Surrey. Registered office: Russell Hill Place, Purley, Surrey.

Hamrad Wholesale, Ltd.—Private company. Registered April 3rd. Capital, £500. Objects: To carry on the business of manufacturers, importers and exporters of, agents for and dealers in all kinds of goods for radio transmission or reception, electricians, electrical and general engineers, &c. Directors: G. J. Carpenter (chairman), 32, St. Lawrence Terrace, W.10; and C. G. Bradley, 348, Portobello Road, Kensington, W.10. Registered office: 32, St. Lawrence Terrace, Lidbroke Grove, Kensington, W.10.

Returns of Electrical Companies

Statements of Capital

Gothic Electrical Supplies, Ltd.—Capital, £50,000 in £1 shares. Return dated January 12th. 36,000 shares taken up. £5,400 paid, £30,600 considered as paid. Mortgages and charges: £14,500.

White, Jacoby & Co., Ltd.—Capital, £7,500 in £1 shares. Return dated January 12th. 5,794 shares taken up. £3,437 paid, £2,357 considered as paid. Mortgages and charges: £1,200.

Bylock Electric, Ltd.—Capital, £15,000 in £1 shares. Return dated January 12th. 7,100 shares taken up. £7,100 paid. Mortgages and charges: £6,500.

Egyptian Power Syndicate, Ltd.—Capital, £10,000 in £1 shares. Return dated January 12th. Two shares taken up. £2 paid. Mortgages and charges nil.

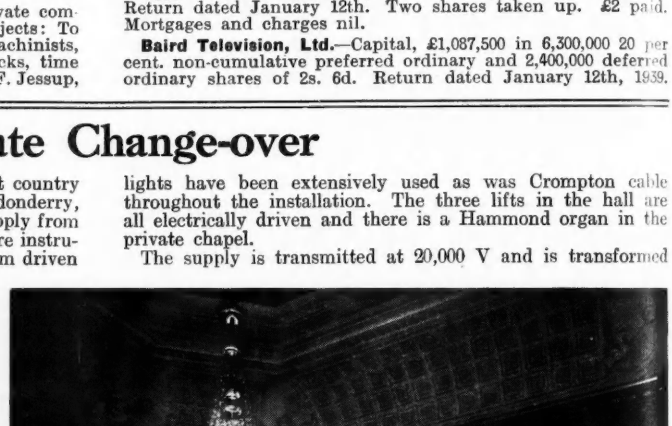
Baird Television, Ltd.—Capital, £1,087,500 in 6,300,000 20 per cent. non-cumulative preferred ordinary and 2,400,000 deferred ordinary shares of 2s. 6d. Return dated January 12th, 1939.

An Estate Change-over

WYNYARD HALL, Durham, one of the largest country houses in England, and an estate of Lord Londonderry, K.G., P.C., M.V.O., is now drawing its electricity supply from the North-Eastern Electric Supply Co., Ltd., who were instrumental in arranging the changeover. Previously steam driven generators with a rated output of 608 A at 115 V feeding batteries were the source of power.

Possibly one of the most interesting and unusual features of this job is the use of a Crompton Parkinson ½-HP motor to drive one of the largest and oldest roasting jacks still in use.

An estate of this size with its attendant country house, which has nearly one hundred bedrooms and a vast ballroom, requires a well-equipped engineer's shop. At Wynyard Hall such a shop is provided. The majority of the machines, such as lathes, &c., are driven by Crompton slip-ring motors. The laundry lineshaft driving hydro-extractor, crimping and washing machines is connected to a 12½HP motor. As a protection from the detrimental, though unavoidably steamy atmosphere common to laundries, the motor and starter are installed in a separate room. There is, however, a stop button in the laundry itself.



The Statue Gallery at Wynyard Hall, showing the magnificent chandelier

At Wynyard Hall fire protection is most important in view of the many priceless antiques and paintings there. During the electrification a Mackley fire pump was installed, driven by a 32-HP 250-V, single-phase 50-cycle Crompton motor. The pump gives an output of 250 gallons per minute against a total head of 250 ft., the water being drawn from an adjacent lake. The pump replaces an old one designed to give 1,000 g.p.m. against only 100 ft. head. There is also an auxiliary fire pump driven by a 20-HP Crompton motor.

In rewiring and lighting the house, many hundreds of lamps were used, including candle lamps for the wonderful old chandeliers in the statue galleries where some remarkable paintings are hung. Picture lights and double ended strip-lights have been extensively used as was Crompton cable throughout the installation. The three lifts in the hall are all electrically driven and there is a Hammond organ in the private chapel.

The supply is transmitted at 20,000 V and is transformed down to 500 V for heating and power, and 250 V for lighting.

The main distribution switchgear consists of three M.E.M. distribution boards, installed about eight years ago, the gear comprising "Glasgow-Rex" switch-fuses, with "Kantark" fuseboards and M.E.M. bus-bar chambers.

Valuable assistance was rendered to the contractors by Mr. M. O. Myers, engineer to Lord Londonderry, and Mr. N. W. Wilthew his agent.

All shares taken up. £577,500 paid (6s. per share on 1,050,000 preferred ordinary and 2s. 6d. per share on 2,100,000 preferred ordinary). £693,750 considered as paid on 3,150,000 preferred ordinary and 2,400,000 deferred ordinary. Mortgages and charges, £10,093 15s.

Siemens-Schuckert (Great Britain), Ltd.—Capital, £30,000 in in £1 shares. Return dated January 12th, 1939. 29,400 shares taken up. £29,400 paid. Mortgages and charges, £13,764 10s.

"New Era" Time & Telephone Systems, Ltd.—Capital, £1,000 in 20,000 shares of 1s. each. Return dated January 12th, 1939. 18,947 shares taken up. £947 7s. paid. Mortgages and charges, £20,740.

Mortgages and Charges

Radiovisor Parent, Ltd.—Satisfaction in full on March 15th, 1939, of debenture dated September 28th, 1938, and registered same date. (According to the register of mortgages the debenture registered September 28th, 1938, originally secured all moneys due not exceeding £1,500.)

Debenture charged on the company's undertaking and property, present and future, dated March 16th, 1939, to secure all moneys due or to become due from the company to British Mutual Banking Company, Ltd., not exceeding £3,000.

Amplilux Lighting & Illumination Co., Ltd.—Particulars filed of £10,000 debentures, authorised March 17th, 1939, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £2,100.

East Anglian Electric Supply Co., Ltd.—Mortgage debenture, charged on the company's undertaking and property, present and future, including uncalled capital, dated March 16th, 1939, to secure £750,000, has been registered. Holders: Edmundsons Electricity Corporation, Ltd.

Receivers Released and Appointed

Electric Shavers, Ltd.—(a) T. H. Fleming, of 28, Norfolk Mansions, Prince of Wales Drive, S.W.1, ceased to act as receiver and manager on March 29th, 1939, (b) on same date J. Crichton-Helme, of 27, Chancery Lane, W.C., was appointed receiver and manager under powers contained in debentures dated December 1st, 1938.

Increases of Capital

B. J. Legg (Industries), Ltd.—The nominal capital has been increased by the addition of £4,000, in £1 shares, beyond the registered capital of £1,000.

Simpson, Baker & Co., Ltd.—The nominal capital has been increased by the addition of £30,000, in £1 ordinary shares, beyond the registered capital of £20,000.

Reports and Dividends

A. Reyrolle & Co., Ltd., held their annual meeting on April 5th, when Sir A. N. L. Wood, Bt. (chairman), who presided, said that they had in hand at the present time extensions to their offices, necessitated by the growing volume of work. The reconstruction of the Parolle Co. was carried through early in 1938, with the result that the shares, representing 60 per cent. of the issued capital of C. A. Parsons & Co., were all held directly by the company, in addition to which they held one-half of the issued capital of £50,000 of Parolle, the other half being held by Parsons. The latter continued to be extremely busy and Parolle also had secured important contracts.

During 1938 they spent £48,367 on their short-circuit testing station and on an impulse-testing laboratory. The latter had been completed. An agreement had recently been entered into with the National Physical Laboratory under which their testing station, together with others, would be available for use and research by manufacturers who did not possess short-circuit testing plant of their own.

They attained in 1938 the greatest output of any year in their history. Orders for their standard productions were lower than in the previous year, which was an exceptional one, but a satisfactory level of demand was maintained, and since the end of the year had tended to increase. They also received a satisfactory amount of work in the export market in spite of more competition. In addition to the normal range of productions they had undertaken certain important contracts for the Government.

The Anglo-Portuguese Telephone Co., Ltd., held its annual meeting on April 5th, when Sir Alexander Roger (chairman), who presided, said that twelve months ago they anticipated that the reduction in the net profit for 1937 as against 1936 would be overhauled during 1938, but anticipations had not yet been realised. Increased political tension throughout the world, indirectly if not directly affected all countries and the fact that Brazilian exchange regulations had reduced the income of many Portuguese nationals, had contributed to unsettled commercial conditions in Portugal, which militated against the natural growth of their revenue.

The year's development in terms of stations represented a net gain of 3,672—equivalent to 7.7 per cent., making a total of 51,098 at the end of the year. An important project of expansion during 1939 would be an extension of 2,000 lines of automatic equipment to the Norte Exchange in Lisbon which would bring the capacity of that exchange to 13,200 lines. So far as the Portuguese Post Office was concerned, considerable progress had been made in the plans approved by the Government last year for the modernisation of the State trunk and local systems. Contracts for the cable network to serve the principal exchanges of the Government were placed by the Post Office early in 1938 and towards the close of the year the Automatic Telephone & Electric Co., with which they were associated, was awarded an important contract for the supply and installation of the automatic equipment required for these exchanges. This contract, which was for £650,000 spread over a period of fifteen years, was secured in face of keen foreign competition.

The Wilkes Berger Engineering Co., Ltd.—Presiding at the annual meeting on April 4th Mr. M. M. Berger (one of the managing directors) said that their subsidiary company had successfully introduced further lines of domestic electrical appliances and, in particular, had made active developments on the lighting side of the electrical industry. They had at the same time actively pursued a policy of developing new ideas and features with a view to incorporation in new articles for sale during 1939. With regard to prospects for 1939, their total sales to date showed an increase of approximately 20 per cent. over those for the corresponding period of last year, although it must be realised that the recent political events had again disturbed the confidence which they felt was returning to industry. Both they and their subsidiaries had already obtained substantial deliveries during 1939, and the value of orders in hand showed a considerable increase over the value of orders in hand at the same time last year.

Switchgear & Cowans, Ltd.—Speaking at the annual meeting held on April 4th Mr. H. Burroughes (chairman) said that the results shown for the period under review were satisfactory. Up to the date of the annual meeting last year they had no evidence of any decrease in their general business, but during the next six months there was a considerable falling off, though during the last three months of the year business began again to improve. Although the subsidiaries as a whole showed reasonable returns, unfortunately the later acquisitions had not developed as quickly as they could have wished. During the year under review they had reorganised and equipped their research department and they were now able to seek orders for new types of equipment. The development of new equipment enabled them to meet competition still more effectively. They had taken steps during the last few months to secure sub-contracts and orders for the rearmament programme, and they had already obtained a number of these which should yield them a reasonable profit. Apart from this, however, they had taken more orders during the first three months of 1939 than for the corresponding periods of 1937 and 1938.

Walsall Conduits, Ltd., reports a net profit for 1938 of £155,323, as compared with £156,084 for 1937. The final ordinary dividend is 35 per cent., maintaining the distribution for the year at 55 per cent., £48,472 is set aside for taxes and general reserve receives £20,000, leaving £46,803 to be carried forward (against £27,077 brought in).

The Shropshire, Worcestershire & Staffordshire Electric Power Co. reports a net profit for 1938 of £555,334, as compared with £543,682 for the preceding year. Reserve receives £260,000 and the dividends remained unchanged at 8 per cent. on the "A" ordinary and 5½ per cent. on the "B" shares, leaving £66,927 to be carried forward (against £65,343 brought in). Meeting: April 24th.

The Western Union Telegraph Co. reports gross operating revenues for 1938 of $91,712,000, a decrease of $8,770,000 as compared with 1937. After meeting all expenses, higher taxes, larger provision for taxation and interest, there is a deficit of $1,638,000, against a surplus of $3,325,769. The accumulated surplus carried forward is reduced from $76,391,000 to $74,433,000.

The North Somerset Electric Supply Co., Ltd., reports a net revenue for 1938 of £47,651, as compared with £45,326 for 1937, to which is added interest, &c. (£3,455) and £3,334 brought in. The ordinary dividend for the year is 7 per cent. (same on smaller capital), and £3,439 is carried forward.

W. T. Henley's Telegraph Works Co., Ltd., proposes to pay a final dividend on the ordinary stock of 10 per cent., less tax, making 15 per cent. for 1938. It is also proposed to pay a cash bonus of 5 per cent., less tax. The net profit for the year, subject to audit, is £374,042, as compared with £383,112 in 1937. Reserve receives £100,000, and the balance carried forward (after providing £16,168 for depreciation in gilt-edged investments) is £415,394, against £426,520 brought in.

Marconi's Wireless Telegraph Co., Ltd., has announced a final ordinary dividend of 8½ per cent., less tax, plus a special dividend of 3 per cent., tax free, making the total distribution for the year 15 per cent. (against 9 per cent.). The preference capital is also to receive an excess dividend of 2 per cent., less tax, and 3 per cent., tax free, making a total of 12 per cent. for the year (against 7 per cent.).

Cable and Wireless (Holding), Ltd., has declared a dividend of 4 per cent., less tax, on the ordinary stock for 1938. The general meeting will be held on May 17th.

Cable and Wireless, Ltd., announces a final dividend of 1¾ per cent., making a total distribution for the year of 3¼ per cent. In paying this dividend it is stated that it has not been necessary to draw on the sum of £300,000 which was placed to reserve in 1937 in anticipation of the effect of the introduction of the Empire flat rate scheme.

The Southern Areas Electric Corporation, Ltd., reports a net profit for 1938 of £31,985, as compared with £37,953 for 1937, to which is added £16,030 brought in, making £48,015. The final dividend is 3 per cent., making 5 per cent. for the year (unchanged), and £19,614 is carried forward. The report states that the subsidiary undertakings as a whole made steady progress, and the kWh sold showed the satisfactory increase of 14 per cent. Their profits were, however, adversely affected by the increased coal costs and the abnormal demand caused by the severe cold in December, which resulted in the bulk supply charges being largely increased. Certain tariff reductions operating during the year coincided with these increased costs.

Edmundsons Electricity Corporation, Ltd., announces that the results of the operations of its group of companies during March, as compared with the corresponding month of 1938, show an increase of 24 per cent. in kWh sold.

Compania Hispano Americana de Electricidad S.A. ("Chade") reports a net profit for 1938 of gold ptas. 29,252,958,73 against gold ptas. 22,713,827,51 for 1937. The latter amount, as explained when the accounts for 1937 were presented, did not include the final dividend paid for that year by the Compania Argentina de Electricidad, after the closing date of the balance sheet of the "Chade." The profit and loss account for 1938 of the latter company includes the final dividend of "Cade" for 1937 and the interim dividend for 1938. It is proposed to pay a final dividend of gold ptas. 30, payable at the rate of

paper pesos 43 on the A, B and C shares, and gold ptas. 6 pay able at the rate of paper pesos 8.60 on the D and E shares. The total dividend will, therefore, be paper pesos 22.50 plus 30 gold ptas. (paper pesos 43) on the A, B and C shares and paper pesos 4.50 plus 6 gold ptas. (paper pesos 8.60) on the D and E shares.

The Cambridge Electric Supply Co., Ltd., reports a net profit for 1938 of £36,818, which with £8,348 brought in, makes £45,166 available. The final ordinary dividend is 4½ per cent., making 7 per cent. for the year, and £10,166 is carried forward.

The Wellingborough Electric Supply Co., Ltd., reports a profit for 1938 of £7,633, as compared with £8,956 for 1937. To this is added £4,145 brought in, and after placing £2,500 to general reserve and £300 to the employees' benevolent fund, there remains a credit balance of £8,978. The final dividend is 6 per cent., making 8 per cent. for the year (same), and £4,978 is carried forward. The sales of electricity totalled 6,604,565 kWh, an increase of 9.4 per cent. as compared with 1937.

Laurence, Scott & Electromotors, Ltd., in a preliminary statement report a profit for 1938 of £123,300, as compared with £110,680 for 1937. It is proposed to pay a dividend of 15 per cent., less tax, on the "A" and "B" ordinary shares for 1938. This is at the same rate as for 1937, but is payable on increased capital.

The St. Austell & District Electric Lighting & Power Co., Ltd., is paying a final dividend of 5 per cent., less tax, maintaining the distribution for the year at 10 per cent.

The Gateshead & District Tramways Co., Ltd., reports a net profit for 1938 of £32,292, as compared with £34,128 in the preceding year, to which is added £35,816 brought in. The ordinary dividend for the year is maintained at 10 per cent. and £44,141 is carried forward.

The Banbury & District Electric Supply Co., Ltd., reports a net profit for 1938 of £7,474, plus £364 brought in; the dividend for the year is 10 per cent., and £339 is carried forward. The undertaking has been sold to the Shropshire, Worcestershire and Staffordshire Electric Power Co. as from July 1st, 1938.

The Kidderminster & District Electric Supply Co., Ltd., reports a profit of £9,414 for 1938 and an available balance of £10,379. The ordinary dividend for the year is raised from 4 to 6 per cent., and £7,379 is carried forward. The undertaking has been sold to the S.W. & S. Co. as from July 1st, 1938.

The Stratford-on-Avon Electricity Co., Ltd., reports a net profit of £6,469 for 1938. The dividend for the year is 8 per cent. (against 7 per cent.), and £2,435 is carried forward against £526 brought in.

Stocks and Shares

Tuesday Evening.

STOCK Exchange markets returned to the House after the Easter holidays in a frame of mind as subdued as that with which they left it last Thursday evening. The character of the news did not lend encouragement to the prospective buyer of stocks and shares. The international situation had, if anything, rather worsened during the interval. The New York Stock Exchange was badly upset during the British holiday, but in Wall Street on Monday a sharp reaction occurred, which temporarily wiped out part of the falls that had taken place in the previous business days. A fresh slump on this, Tuesday, evening, showed how nerve-ridden Wall Street has become.

The atmosphere is charged with uncertainty and the reassembly of Parliament on the Thursday in this week became awaited with a feeling of anxiety which not even the traditional sang-froid of Stock Exchange members was able entirely to disguise.

Cable and Wireless Dividends

It takes uncommonly good news, just now, to induce individual prices to go against the trend. The announcement of a 4 per cent. dividend on Cable and Wireless ordinary stock, however, was good enough to have that effect. The price of the ordinary stock was promptly advanced from 43¼ to 46¼, and that of the preference from 80½ to 84. Last year, the ordinary dividend was at the same rate, but most people were prepared to see a cut of ½ or 1 per cent. this time. Such a frame of mind had been induced, of course, by the signs of weakness in the monthly index to traffic receipts, which had recorded a drop of over 12 per cent. on the year. Even after the rise in prices, the yields of 9.4 per cent. on the ordinary and 6.65 per cent. on the preference are still high enough to suggest that there remains a cautious attitude towards prospects in a year which, it has to be admitted, promises none too well for companies largely dependent on the activity of international trade. The ordinary stock in its ex dividend state is quoted 42½, equivalent to a gain of 4 points. The preference at 82½ is no more than a point higher on the week.

The Holding Company is making a payment of 3¼ per cent., against last year's 3½ per cent., without recourse to the special fund of £300,000 set up with the express intention of cushioning such disturbance to profits as might be expected in the early stages of the new scheme for a flat rate of charges in the Empire. On the surface, the dividend decisions indicate that the scheme has had a degree of success beyond the expectation of the sponsors. Much remains to be clarified by the publication of the full figures and the report, due in the first week of May.

Central Electricity Board Report

An excellent impression is made by the Central Electricity Board report for 1938, the first year in which the Grid was in full operation throughout the country. The event is signalised by a thorough review of the economies effected by the Grid. Among the more impressive figure are the capital saving of £22 millions—nearly three-quarters of the cost of construction—and the 24 per cent. reduction in the cost of generation. Progress has been ahead of expectations. Interest on all the stocks is already covered by revenue, although there is no obligation for this to take effect until another three years. The stocks have earned, it may be submitted, the right to be included in stocks eligible for trustee investment: their security is as good as, if not better than, some of the issues that come within the orbit of the Trustee Act.

Henley's Telegraph and Laurence, Scott

Preliminary figures published by Henley's Telegraph come well up to the standard set by the 1938 reports already issued by other leading cable manufacturers. Profits are little below the record established in 1937. A final dividend of 10 per cent., with a cash bonus of 5 per cent., again brings the total distribution to 20 per cent. This rate is equivalent to a 5 per cent. increase on the 30 per cent. payments which were made for many years until the doubling of the capital in 1936. The yield of £5 2s. 7d. per cent. with the shares at 19s. 6d. reflects the high investment rating of shares connected with the cable manufacturing industry.

Laurence, Scott & Electromotors rely on four main sources for their orders, according to the chairman's review a year ago. These are the industrial, marine and export markets, and the Government departments. Over this broad front activity has evidently been well maintained during 1938, for the preliminary statement shows profits to be up by £12,600 to £123,300. A dividend of 15 per cent. is declared on the "A" and "B" shares. This is at the same rate as last year's, but is paid on more capital. The "A" shares stand at 11s. to yield £6 13s. 4d. per cent.

Walsall Conduits report practically no change in net earnings. The previous dividend of 55 per cent. is repeated, and gives at the present price of 27s. a yield of £8 3s. 0d. per cent. on these 4s. shares.

The Slump in Americans

Mention has been made above of the falls in the prices of American stocks and shares. The fact of his being several thousand miles removed from the theatre of turmoil seems to be ignored by the Wall Street operator, his nerves already jangled by disappointment at the failure of American industry to show the progress expected of it. Heavy falls in New York shattered the small remaining amount of confidence felt on this side in the assumed resiliency of the American market. A drop of 5 dollars in American Telephone & Telegraph shares brought down the price to 162½. International "Tel. & Tel." fell to 7½, Western Unions to 19½. Apart from its influence upon Americans, the international situation has lowered Great Northern Telegraphs to 29½.

Home Rails

The character of the traffics statements issued weekly by the main-line railway companies is generally judged by comparison with the corresponding figures of the previous year. For many months during 1938 the verdict was heavily unfavourable. At present, however, traffic receipts are tending to improve, while coming up for comparison with falling figures in the spring of 1938. Consequently the size of the "minuses" in the comparisons has been dwindling, and the last week before Easter actually witnessed the first reappearance of the "plus" sign. Taken together with the hopes of an early and satisfactory outcome to the "Square Deal" negotiations, this state of affairs would normally be expected to enliven the market in the stocks concerned. As it happens, prices have not escaped the general decline, the labour claims being in themselves a subduing influence. Consequently yields of about 8 per cent. are still to be obtained from the so-called border-line stocks; that is to say, the isues on which the dividend is barely covered at the current level of profits. Such a stock is Southern Railway 5 per cent. preferred ordinary, which stands at 61½. In this case the 1938 profits were a little short of the amount required to pay the full dividend. London Transport "C" stock is two points off, at 68½, despite the chance of an early decision to adjust fares in the London area.

Price Movements

Prices of electrical equipment and manufacturing shares reflect only to a small extent the fresh weakness of the industrial markets. Among the leading shares, General Electrics, at 77s. 6d., British Insulated, at 4½, and J. Lucas, at 58s. 9d., have actually gained ground. On the other hand, there are losses of half a crown in Lancashire Dynamos, at 62s. 6d., Westinghouse Brakes, at 47s. 6d., and Consolidated Signals, at 82s. 6d. Ericssons, at 37s. 6d., and Murex, at 73s. 9d., are also lower. Movements in the market for electricity supply shares, which, as a rule, take their cue as much from the gilt-edged as the industrial markets, are confined to a few losses of 9d. or less. In the overseas group, Cawnpore Electrics are down to 28s. 9d. Other changes of note are the fall in Electric and Musical Industries from 11s. 6d. to 10s. 3d., and the rise in T. Tillings to 43s. 9d

ELECTRICAL COMPANIES' SHARES

Prices, dividends and yields

Company	1939 High-est	1939 Low-est	Dividend Pre-vious	Dividend Last	Price April 11	Rise or Fall	Yield p.c. £ s. d.
Home Electricity Companies							
Bournemouth and Poole ...	68/3	65/–	15	15	65/9	—	4 11 2
British Power & Light ...	30/9	26/–	7	7	29/6	—	4 15 0
City of London	33/9	31/–	7½	7½	32/–	—	4 2 6
Clyde Valley	37/9	34/–	8	8	35/–	–9d.	4 11 6
County of London... ...	46/9	41/9	10½	10½	42/6	–6d.	4 18 8
Edmundson's:							
7% Pref....	31/6	30/–	7	7	30/6	—	4 11 10
Ord.	27/9	23/–	9	9	24/6	—	—
Elec. Dis. Yorkshire ...	41/6	37/9	9	9	40/–	—	4 10 0
Elec. Fin. and Securities ...	47/9	45/–	12½	12½	47/6	—	5 5 3
Elec. Supply Corporation...	51/9	48/3	12	12	51/3	—	4 13 7
Isle of Thanet	20/–	18/6	4	4	18/6	—	4 6 6
Lancs Light and Power ...	34/6	29/–	7½	7½	32/6	—	4 12 4
Llanelly Elec.	22/6	21/6	5½	5½	21/6	—	5 2 4
Lond. Assoc. Electric ...	29/3	27/6	7	7	27/6	–6d.	5 1 10
London Electric	34/3	32/–	7	7	33/–	—	4 4 10
London Power Deb. Red....	106½	102¼	5	5	103½	—	4 16 6
Metropolitan	51/–	45/3	12	12	48/3	—	4 19 6
Midland Counties	38/9	34/–	8	8	37/–	—	4 6 6
Mid. Elec. Power	41/9	38/3	8	9	38/9	—	4 13 0
Newcastle Elec.	28/9	26/6	7	7	28/9	—	4 17 4
North Eastern Electric:							
Ordinary...	32/3	29/–	7	7	29/6	—	4 15 0
7% Pref....	32/6	30/–	7	7	31/–	—	4 10 4
Northampton	48/–	45/–	10	10	47/6	—	4 4 2
Notting Hill 6% Pref. (£10)	13½	13½	6	6	13½	—	4 15 9
North Met. Elec.:							
Ordinary...	46/6	41/6	10	10	43/9	—	4 11 4
6% Pref....	29/–	27/6	6	6	27/6xd.	—	4 7 3
Richmond Elec.	29/–	27/3	7	7	28/9	—	4 17 5
Scottish Power	38/9	34/–	8	8	35/–	—	4 11 6
Southern Areas	22/9	19/6	4½	5	21/–	–6d.	4 15 3
South London	30/9	29/–	7	7	29/–	—	4 16 7
West Devon	23/3	22/6	5	5	1½	—	4 9 0
West Glos.	21/3	19/–	2	2	18/6	—	2 3 3
Yorkshire Elec.	38/6	34/9	8	8	36/6	—	4 7 6
Overseas Electricity Companies							
Atlas Elec.	4/3	2/–	Nil	Nil	3/–	—	—
Calcutta Elec.	39/–	36/3	12*	10*	37/6	—	5 6 7
Cawnpore Elec.	34/6	29/6	10	10	28/9	–⅛	6 19 0
East African Power ...	26/3	22/6	7	7	25/–	—	5 14 0
Jerusalem Elec.	24/6	23/3	5	6	24/–	—	5 0 0
Kalgoorlie (10/–)	10/6	9/6	7½	7	10/3	—	7 6 4
Madras	31/–	29/6	8*	8	30/–	—	5 6 8
Montreal Power	34½	31	1½	1½	32½	–½	—
Palestine Elec. "A" ...	29/6	27/–	7½*	7½*	26/3	—	5 14 3
Perak Hydro-electric ...	18/9	16/–	7	6	17/–	–6d.	6 17 2
Shawinigan Power ...	23¾	20¼	85cts.	83cts.	20¾	–¾	—
Tokyo Elec. 6%	61	50	6	6	52½	—	11 8 6
Victoria Falls Power ...	72/–	62/–	12	13½	66/3	—	4 1 7
Whitehall Investments Pref.	19/6	16/–	7½	7½	17/6	—	8 11 6
Public Boards							
Central Electricity:							
1950–70	112	108	5	5	108½	—	4 12 2
1955–75	115½	110	5	5	110½	—	4 10 6
1951–73	106½	103½	4½	4½	105	—	4 5 9
1963–93	95½	91½	3½	3½	91½	–1	3 16 6
London Elec. Trans. Gtd.	88½	85½	2½	2½	85½	–1½	2 18 6
London & Home Counties,							
1955–75	107½	106½	4½	4½	107	—	4 4 1
Lond. Passenger Transport:							
A	114½	104¾	4½	4½	110	—	4 1 10
B	117½	107½	5	5	110	—	4 11 0
C	78¼	68	4¼	4	68½	–2	5 16 10
West Midlands Joint Elec.,							
1948–68	112½	110	5	5	109½	—	4 11 3
Telegraph and Telephone							
American Tel. & Tel. ...	180	159	9	9	162½	–5	5 10 9
Anglo-Am. Tel.:							
Pref.	101½	96	6	6	92½xd.	–3	6 9 8
Def.	23⅝	20	1½	1½	20	—	7 10 0
Anglo-Portuguese	24/–	19/9	8	8	21/3xd.	—	7 10 7
Cable & Wireless:							
5½% Pref.	90½	75	4½	5½	82½	+1	6 13 4
Ord.	49	34	4	4	42½xd.	+4	9 8 4
Income	100	98½	—	—	98½	–½	4 1 3
Canadian Marconi $1 ...	5/3	3/9	—	Nil	4/–	—	—
Globe Tel. & Tel.:							
Ord.	28/–	23/6	5½*	7½*	25/–	—	6 0 0
Pref.	26/9	23/9	6	6	25/–	—	4 16 0
Great Northern Tel. (£10)...	38	30	20	20	29½	–1	6 15 7
Inter. Tel. & Tel.	10½	8	Nil	Nil	7½	–1½	—
Marconi-Marine	29/–	23/–	7½	10	27/6xd.	—	7 5 6
Oriental Telephone Ord. ...	2½	46/3	12*	12*	2 7/8xd.	—	4 16 0
Radio Corpn.	8⅛	6⅛	8	6	6	–1½	—
Telephone Props.	14/–	12/9	5	6	13/9	—	8 14 6
Telephone Rentals (5/–) ...	10/–	8/6	5	6	9/–	—	3 6 8
Western Union	25½	22	2¾	—	19½	–2	—
Traction and Transport							
Anglo-Arg. Trams:							
First Pref.	7/6	3/6	Nil	Nil	7/6	—	—
4% Inc.	16	7	Nil	Nil	12	—	—
British Electric Traction:							
Def. Ord.	1000	700	5	6	850	—	—
Pref. Ord.	164	158	8	8	160	—	5 0 0
Bristol Trams	48/6	37/3	8	10	43/9	—	4 11 2
Brazil Traction	13	7⅞	$1	—	10⅜	–⅛	—
Calcutta Trams	25/6	24/3	8	8	24/–	—	6 13 4
Cape Elec. Trams.... ...	18/–	16/9	5	6	17/6	—	6 17 2
Lancs Transport	36/6	33/6	10	10	35/–	—	5 14 3
Mexican Light:							
1st Bonds	25	21	5	5	25	—	—
Rio 5% Bonds	81	47	5	5	73	–2	6 17 0
Southern Rly:							
5% Prefd.	71	48	5	5	61½	–1	8 2 8
5% Pref....	97½	80	5	5	89	–1½	5 12 4
T. Tilling	48/–	39/6	10	10	43/9	+⅛	4 11 4
Tilling & B.A.	53/–	50/–	10	9*	52/6	—	3 8 7
West Riding	37/9	32/–	10	10	33/3	—	—
Equipment and Manufacturing							
Aron Electricity Ord. ...	32/3	28/9	15	15	31/3	—	9 12 0
Assoc. Elec.:							
Ord.	45/3	34/9	10	10	38/6xd.	—	5 4 0
Pref.	36/6	34/6	8	8	35/6	—	4 10 0
Automatic Telephone & El.	46/6	39/3	10	12½	42/6	—	5 17 9
Babcock & Wilcox ...	42/9	37/–	10	10	39/–	–1/–	5 2 7
British Aluminium Ord. ...	57/–	48/9	12½	12½	54/3	—	4 12 3
British Insulated Ord. ...	88/–	77/–	20	20	4½	+⅛	4 16 10
British Thermostat (5/–)...	16/–	12/–	18½	18½	13/3xd.	+⅛	6 19 7
British Vacuum Cleaner(5/–)	22/6	19/–	40	40	20/–	—	—
Brush Ord.	5/9	4/6	Nil	Nil	5/–	—	—
Callender's	92/–	70/–	20	20	81/3	—	4 18 9
Chloride Elec. Storage ...	82/3	73/–	15	20	3⅞	—	5 3 1
Consolidated Signal ...	96/–	80/9	36½	36½	82/6	–⅛	8 16 9
Crabtree (10/–)	25/6	21/6	17½	17½	23/9	—	7 7 4
Crompton Parkinson:							
Ord. (5/–)	21/–	14/9	12½	15	17/6	—	—
E. K. Cole (5/–)	9/–	4/–	5	10	6/–	–6d.	8 6 8
Elec. & Musical Industries							
(10/–)	14/9	8/9	10	5	10/3	–⅛	4 17 7
Electric Construction ...	38/6	30/6	10	12½	35/–	—	7 2 10
Enfield Cable Ord. ...	58/6	2½	25	16½	51/3	—	6 5 6
Electrical Switchgear (10/–)	27/–	26/–	16	16	25/9	—	6 4 3
English Electric	36/–	30/3	10	10	32/-xd.	+1-	6 5 0
Ensign Lamps (5/–) ...	14/6	13/9	—	25	14/–	—	8 18 6
Ericsson Tel. (5/–) ...	43/–	35/-	25*	25*	37/6	–⅛	3 6 8
Ever Ready (5/–)	24/–	19/3	45	35	22/–	—	7 19 1
Falk Stadelmann	27/–	25/6	10	10	25/–	—	8 0 0
Ferranti Pref.	25/6	23/6	7	7	24/–	—	5 16 8
G.E.C.:							
Pref.	31/9	29/3	6½	6½	30/–	—	4 6 8
Ord.	82/–	70/9	17½	20	77/6	+6d.	5 3 3
Greenwood & Batley ...	27/6	24/6	7	15	26/3	—	11 8 2
Hall Telephone (10/–) ...	22/3	19/6	15	15	19/3	–9d.	7 16 0
Henley's (5/–)	21/–	17/9	20	20	19/6	—	5 2 7
4½% Pref.	23/–	21/6	4½	4½	22/6	—	4 0 0
Hopkinsons	43/9	37/3	10	12	43/9	—	5 9 7
India-Rubber Pref. ...	21/–	20/–	5½	5½	21/3	—	5 3 6
Intl. Combustion	117/–	97/–	32½	32½	5⅛	—	7 3 6
Ismay Industries (5/–) ...	1/1½	9d.	6	6	9d.	—	—
J. Lucas	60/–	52/–	15	15	58/9	+⅛	5 2 1
Johnson & Phillips ...	41/–	32/–	10	12½	37/6	—	6 13 6
Lancashire Dynamo ...	68/–	61/–	25	25	62/6	–½	8 0 0
Laurence Scott (5/–) ...	12/–	10/–	15	15	11/-xd.	+3d.	6 13 4
London Elec. Wire ...	31/6	29/–	12	7½	30/–	—	5 0 0
Mather & Platt	50/–	42/6	13½	13½	47/–	–6d.	5 13 8
Metropolitan Elec. Cable Pf.	21/3	21/–	5½	5½	21/3	—	5 3 6
Murex	85/9	63/9	20	20	73/9	–⅛	5 8 5
Pye Deferred (5/–) ...	13/9	7/6	5	25	11/–	+1/–	11 5 2
Revo (10/–)	35/6	32/3	12	17½	33/9	—	5 3 8
Reyrolle	61/–	52/6	12½	12½	57/6xd.	+1/–	4 7 0
Siemens Ord.	26/9	20/6	7½	7½	22/6	–9d.	6 13 4
Strand Elec. (5/–) ...	5/6	4/9	5	10	5/0	—	10 0 0
S. Smith (1/–)	9/9	6/–	37½	50	8/9	—	5 14 3
Switchgear & Cowan (5/–)	15/-	13/9	20	20	13/9	—	7 5 6
Telegraph Condenser (10/–)	7/6	5/–	5	5	7/6	—	6 13 4
Telegraph Construction ...	2⅛	37/6	10	10	37/6	—	5 6 8
Telephone Mfg. (5/–) ...	10/–	8/–	9	9	9/–	—	5 0 0
Tube Investments... ...	91/–	82/9	23¾	23¾	87/–	–6d.	5 10 6
Vactric (5/–)	4/3	2/3	10	4	3/9	—	5 6 8
Vickers (10/–)	24/6	20/–	10	10	20/9	–9d.	4 16 5
Westinghouse Brake ...	54/9	43/9	17½	17½	47/6	–¼	7 7 4
Walsall Conduits (4/–) ...	31/9	24/–	55	55	27/-	–6d.	8 3 0
West, Allen (5/–)	7/6	5,9	7½	10	6/6xd	—	7 13 10

* Dividends are paid free of Income Tax.

NEW PATENTS

Electrical Specifications Recently Published

Compiled by a firm of chartered patent agents. The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1936

26766. "Electron multipliers." Baird Television, Ltd., and J. A. Colls. September 17th, 1937. (502472.)

1937

12561. "Control circuits for vapour arc convertors and the like." General Electric Co., Ltd., and C. R. Dunham. June 3rd, 1937. (502166.)

15916. "Electrical measuring instruments." W. Biernawski and Panstwowe Wytwornie Uzbrojenia w. Warszawie. June 8th, 1936. (502168.)

16036. "Correcting arrangements for telegraph signals." H. F. Wilder. June 9th, 1937. (502169.)

19505. "Manufacture of electric cables or other insulated electric conductors for power conduction or heating purposes." Solution Trust, Ltd. (Soc. Alsacienne de Constructions Mecaniques). July 14th, 1937. (502344.)

19516. "High-frequency tubed circuits." F. T. Lett. July 14th, 1937. (502248.)

21913. "Variable-inductance tuning devices for radio apparatus." P. R. Mallory & Co., Inc. August 8th, 1936. (Cognate application 21914/37.) (502172.)

22173. "Radio receivers and the like." B. J. Banfield. August 12th, 1937. (502178.)

22500. "Electrical signalling systems." Automatic Telephone & Electric Co., Ltd., and P. N. Roseby. August 16th, 1937. (502407.)

22519. "Radio direction - finding methods and apparatus." Bronzavia Soc. Anon. August 19th, 1936. (502408.)

22787. "Radio frequency tuning devices." P. R. Mallory & Co., Inc. August 8th, 1936. (502251.)

24962. "Television receivers." Baird Television, Ltd., and D. V. Ridgeway. September 14th, 1937. (502351.)

24994. "Electron-discharge devices for giving visual indications of voltage." Marconi's Wireless Telegraph Co., Ltd. (Radio Corporation of America). September 14th, 1937. (502181.)

25002. "Cathode-ray tube circuit arrangements." Fernseh Akt.-Ges. September 14th, 1936. (502356.)

25007. "Cables for transportable trunk communication electric cable installations." Siemens & Halske Akt.-Ges. September 14th, 1936. (502357.)

25019. "Television receivers." A. Carpmael (H. R. C. Van de Velde). September 14th, 1937. (502358.)

25075. "Mercury switch electric control of battery-powered electric motor-driven road vehicles and trucks." G. S. Jinks. September 15th, 1937. (502483.)

25097. "Electric-discharge devices." British Thomson-Houston Co., Ltd. September 15th, 1936. (502534.)

25204. "Wind - power electrical machines." C. Lean (H. Honnef). September 16th, 1937. (502417.)

25222. "Radio signalling apparatus." K. Yoshida. September 16th, 1937. (502421.)

25273. "Cables having inserted insulated electric conductors." Siemens-Schuckertwerke Akt.-Ges. September 18th, 1936. (502485.)

25302. "Circuit arrangements comprising a metal vapour rectifier having an ignition electrode." General Electric Co., Ltd., and D. G. Prinz. September 17th, 1937. (Cognate application 14689/38.) (502255.)

25311. "Telephone systems." Automatic Telephone & Electric Co., Ltd., J. W. McClew and O. A. Pearce. September 17th, 1937. (502539.)

25403. "Apparatus for supplying luminescent discharge tubes with current." Soc. Anon. Fonciere Industrielle & Commerciale. September 18th, 1936. (502540.)

25509. "Electric motor control systems." British Thomson-Houston Co., Ltd., and F. E. Butler. September 20th, 1937. (502498.)

25524. "Electrical coupling circuits." Telefunken Ges. für Drahtlose Telegraphie. September 19th, 1936. (502499.)

25615. "Advertising signs and the like comprising electric-discharge lamps." General Electric Co., Ltd. (Patent-Treuhand-Ges. für Elektrische Glühlampen). September 21st, 1937. (502259.)

26135. "Combinations of electric-discharge lamps and electric incandescent lamps." General Electric Co., Ltd. (Patent-Treuhand-Ges. für Electrische Glühlampen). September 27th, 1937. (502367.)

27138. "Telephone systems." Automatic Telephone & Electric Co., Ltd., C. E. Beale, I. T. Richards, and O. A. Pearce. October 6th, 1937. (502545.)

27497. "Switches for repeatedly opening alternating - current circuits." Igranic Electric Co., Ltd. October 9th, 1936. (502190.)

27675. "Electro-magnetic measuring device." W. H. Tait. October 12th, 1937. (502500.)

27758. "Electric fusible cut-outs." General Electric Co., Ltd., and J. W. Gibson. October 12th, 1937. (502501.)

28007. "Terminal boards for electrical apparatus." F. Waterton, and Metropolitan-Vickers Electrical Co., Ltd. October 14th, 1937. (502372.)

29014. "Electrically-actuated alarm clocks." S. Smith & Sons (Motor Accessories), Ltd., and H. N. Walford. October 23rd, 1937. (502197.)

29737. "Earthing posts for wireless receiving-apparatus." C. J. Adie & Nephew, Ltd., and R. A. Fletcher. October 30th, 1937. (502269.)

30991. "Operating mechanism for electric switches." Drake & Gorham, Ltd., and B. P. Worthington. November 11th, 1937. (502201.)

31000. "Installation of electric cables in pipe lines or ducts containing oil." Okonite-Callender Cable Co., Inc., and Okonite Co. November 21st, 1936. (502504.)

31650. "Arrangements for alarm-signalling over lines to a telephone exchange." J. A. Smith. December 19th, 1936. (502202.)

33246. "Circuits for operating high-pressure mercury-vapour lamps." General Electric Co., Ltd., and V. J. Francis. December 1st, 1937. (Addition to 486586.) (502506.)

35082. "Automatic liquid-level regulating device electrically controlled, applied to washing-machines and other vessels." W. K. Benwell. December 18th, 1937. (502378.)

35839. "Movable contacts of electric switches, and their manufacture." J. H. Tucker and Co., Ltd., and F. C. Fuke. December 28th, 1937. (502508.)

1938

101. "Apparatus for transmitting television and the like." General Electric Co., Ltd., and D. C. Espley. January 3rd, 1938. (502509.)

4241. "Electric - discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. February 13th, 1937. (502383.)

5981. "Dynamo for cycles." A. Weitzi and V. Seklehner. March 31st, 1937. (502285.)

11753. "Electric circuit-breaker having arc-extinguishing arrangements." Allmänna Svenska Elektriska Aktiebolaget. April 16th, 1937. (502443.)

12127. "Piezo-electric recording and reproducing devices suitable for use in dictating-machines." H. T. P. Gee (Dictaphone Corporation). September 21st, 1937. (Divided out of 502423.) (Convention date not granted.) (502445.)

12176. "Electric boiling-plates." Akt.-Ges. Kummler & Matter. April 22nd, 1937. (Cognate application 12177/38.) (502446.)

12724. "Methods of insulating electric conductors." British Thomson-Houston Co., Ltd. April 30th, 1937. (502518.)

12813. "High-frequency inductance coils." R. Bosch Ges. April 29th, 1937. (502296.)

15476. "Transmitting arrangements for radio direction-finding systems." C. Lorenz Akt.-Ges. May 25th, 1937. (502302.)

16652. "Dry disc electric rectifiers." W. W. Triggs (P. R. Mallory & Co., Inc.). June 3rd, 1938. (502306.)

16773. "Transmitters for step-by-step telegraph systems." Creed & Co., Ltd., A. E. Thompson and R. D. Salmon. September 17th, 1937. (Divided out of 490404.) (502521.)

17189. "Electric switches." British Thomson-Houston Co., Ltd. June 9th, 1937. (502452.)

17414. "Circuit arrangements comprising electric-discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. June 14th, 1937. (502310.)

18437. "Electrically propelled road vehicles." Bleichert Transportanlagen Ges. June 23rd, 1937. (502313.)

19443. "Electric switches." British Thomson-Houston Co., Ltd. June 30th, 1937. (502393.)

19547. "Appliance for determining the moisture content of paper or the like electrically." F. A. Heinrici. July 3rd, 1937. (502525.)

20018. "Electric - discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. July 9th, 1937 (502311.)

21222. "Electron - discharge devices utilising secondary emission." Electrical Research Products Inc. August 31st, 1937. (502528.)

23838. "Picture-telegraph apparatus." C. Lorenz Akt.-Ges. August 24th, 1937. (502327.)

24913. "Electric incandescent lamps." Britisb Thomson-Houston Co., Ltd. August 24th, 1937. (502330.)

25141. "Driving of dynamo-electric generators." British Thomson-Houston Co., Ltd. August 27th, 1937. (502397.)

25764. "Radio aerials." G. De Monge. October 30th, 1937. (502460.)

29139. "Low-capacity air-dielectric condensers." Fabbrica Italiana Magneti Marelli. October 8th, 1937. (502532.)

TRADE MARK APPLICATIONS

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from April 5th :—

Letter C combined with a Double Cross. No. 583751. Class 8 (III). Electric batteries and accumulators (not being for medical purposes), cells for electric batteries, electric resistances, rheostats, magnets (not for medical purposes), and wireless telephonic and telegraphic apparatus and parts thereof.—Le Société Le Carbone-Lorraine, 41, Rue Jean Jaures, Gennevilliers, Seine, France (British representatives, D. Young & Co., 11-12, Southampton Buildings, Chancery Lane, London, W.C.2).

Neco (lettering and design). No. 600713. Class 7 (IV). Dynamo-electric machines, electrically driven lathes and other machine tools, electrically driven pumps, air compressors, and laundering and food preparing machinery, magnetic brakes, &c.—The Normand Electrical Co., Ltd., Neco Works, North Street, Clapham Common, London, S.W.4.

Sterlac. No. 604719. Class 9 (IV). Electrical apparatus.—Sterling Cable Co., Ltd., Queensway, Enfield, Middlesex.

Design only. No. 603964. Class 11 (IV). Electric cookers.—Croydon Corporation Electricity Department, Electric House, 38, High Street, Croydon, Surrey.

Lumolite. No. 604722. Class 11 (IV). Installations for lighting.—Sterling Engineering Co., Ltd., High Road, Dagenham, Essex.

Indoflux. No. 604737. also Technalux, No. 604738. Class 11 (IV). Lighting fittings.—The Co-operative Wholesale Society, Ltd., 1, Balloon Street, Manchester.

Flamex. No. 605128. Class 11 (IV). Carbons for electrical purposes.—Charles H. Champion & Co., Ltd., National House, 60-66, Wardour Street, W.1.

CONTRACT INFORMATION

Particulars of work for which tenders are invited, contracts placed, and building schemes promising work for electrical contractors and traders

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses. Further details of items marked with an asterisk can be obtained from the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

Australia. — Melbourne. — May 16th. Magnetic submarine telephone cable. (T. 20360/39.)*

May 9th. State Electricity Commission of Victoria. Electrical dust-precipitation plant. (April 7th.)

Tasmania.—June 12th. Electricity Department. Terminal station switchboard, one motor-generator set, auto-transformers and high- and low-voltage underground cables. (T. 20437/39.)*

Birkenhead.—April 18th. Electricity Department. Stores and materials for twelve months. (March 31st.)

Bootle.—April 17th. Watch Committee. Sodium electric lighting at Aintree Road. (April 7th.)

Bury.—April 24th. Electricity Department. Fire extinguishing equipment at Chamber Hall power station. (See this issue.)

Carlisle.—May 3rd. Electricity Undertaking. Transformers. (See this issue.)

Chichester.—April 21st. City Council. Transformers for twelve months. (April 7th.)

Dundee.—April 25th. Harbour Trust. Two 2-ton electric goods lifts at No. 2 Warehouse, Victoria Docks, Dundee Harbour. General manager and engineer, Harbour Chambers.

Eastbourne.—May 10th. Electricity Department. Circuit-breakers, protective relays, potential transformers and tripping battery equipment. (See this issue.)

East Grinstead.—April 25th. U.D.C. One 200-kVA, 6,600-V transformer. (See this issue.)

Edinburgh.—May 5th. Governors of Morrison's Academy, Crieff. Heating and electrical installation at new school for girls. D. B. Sinclair, clerk to the governors, 43, Castle Street.

Egypt.—Cairo.—May 4th. Ministry of Public Heath. Electric lighting installation at the Abou Tig Hospital. (T. 21055/39.)* Electrical apparatus and materials for the electricity supply to the El Azab Waterworks. (T. 21053/39.)*

Eire.—Enniscorthy.—April 18th. Electrical installation at the District Mental Hospital. C. B. Molony, resident medical superintendent.

Fife.—April 28th. District Asylum. Materials, including electric lamps, switches, flexes, cables, plugs, roses, holders, fuse wire, shades, tubing and dry batteries. Medical superintendent, Fife District Asylum, Cupar.

Glasgow.—April 22nd. Gas Department. Electrically driven portable scraper for Dawsholm Works. Town Clerk.

May 1st. Public Health Department. Electrical work at Cowglen Hospital. Office of Public Works, City Chambers (Room 81) (deposit £5 5s.).

India.—Simla. — April 29th. Indian Stores Department. Separators for train lighting accumulators and cells for twelve months. (T. 20906/39.)*

Middlesex.—April 22nd. County Council. One three-throw, vertical, single acting, reciprocating pump, coupled through gearing to an electric motor, with all necessary piping and valves. Engineer-in-charge, West Middlesex Main Drainage Works, Isleworth.

Milford Haven.—April 29th. Electricity Department. Cables, cut-outs, meter boards and adhesive tape for twelve months. (See this issue.)

Morocco. — Rabat.—April 21st. Protectorate Post Office Authorities. Quantities of lead-covered telephone cables. (T. 20250/39.)*

Newark-on-Trent.—April 17th. Electricity Department. One 500-kVA out-door type transformer, complete with on load tap changing equipment. (March 31st.)

Newcastle-on-Tyne.—City Council. Installation of two-way electric switches in 900 houses on the various housing estates. Plans by the city architect, 18, Cloth Market.

Newcastle-under-Lyme. — May 12th. Highways Committee. Seventy-three street lighting lamps, lanterns, fittings and columns. (March 31st.)

New Zealand. — Wellington. — May 24th. Posts and Telegraph Department. 60,000 porcelain insulators. (T. 20755/39.)*

May 23rd. 7,920-ft. of telephone cable. (T. 20753/39.)*

Oldbury. — April 17th. Corporation. High-pressure electric-discharge lighting on the Birmingham-Wolverhampton Road between Hagley Road West and Birchfield Lane. (April 7th.)

Oldham.—April 17th. Electricity Committee. Painting with wood preservative of cooling towers at the Corporation generating stations. (April 7th.)

Portsmouth.—April 14th. Electricity Undertaking. One 15,000-kVA transformer at the generating station, Gunwharf Road. (March 31st.)

April 14th. 1,500 cooker control units and 2,000 switch fuses. (March 31st.)

April 17th. 33-kV cables. (April 7th.)

Rotherham.—April 24th. R.D.C. Electrical wiring installations in council houses. (April 7th.)

Southport.—April 17th. Town Council. Two lifts. (March 31st.)

South Africa.—Johannesburg.—April 19th. City Council. Three 380-V condensers. (T. 20524/39.)*

May 15th. Railways and Harbours Administration. Two electrically driven portal jib cranes for Port Elizabeth Harbour. (T. 20519/49.)*

May 4th. Union Tender and Supplies Board. Motor generator sets, switchboard and rectifier for the General Telegraph Office, Pretoria. (T. 20390/39.)*

Paulpietersburg. — May 1st. Town Board. Hydro-electric power plant, including water turbines, generators, switchgear and high-voltage line. (T. 20216/39.)*

Grahamstown.—May 23rd. Corporation. Boiler and stoker, turbo-alternator, cooling water equipment, switchgear and exciter pillar, generator protective gear and a voltage regulator for extensions to the power station. (See this issue.)

Tottenham.—April 25th. Transport and Cleansing Department. Magnetic separator. (March 31st.)

Wakefield.—April 24th. County Council of the West Riding of Yorkshire. Installation of electric lighting at Shipley Technical Institute and the extensions at Thurcroft Council School. Clerk of the County Council, County Hall.

Ware.—April 29th. U.D.C. Electric lighting installations in fifteen bungalows on the East Mead estate. (See this issue.)

Warrington.—April 17th. Electricity and Transport Committee. Transformers. (March 31st.)

Orders Placed

Barrow-in-Furness.—Electricity Committee. Accepted for twelve months. Meters.—Sangamo Weston; Aron Electricity Meter. Transformers.—British Electric Transformer Co. Electric irons.—British National Electrics. Electric kettles.—G.E.C. Water heaters.—Santon. Electric cookers.—Hotpoint; Revo Electric Co.; English Electric Co. Cables.—Crompton Parkinson.

Berwickshire.—County Council. Accepted. Electrical work at County Library, Newtown Street, Duns (£117).—Grant & Reid.

Birkenhead.—Electricity Committee. Accepted. One 5,000-kVA transformer (£2,384).—Ferranti.

Accepted for twelve months: Transformers (all types).—G.E.C. High-voltage switchgear.—Crompton Parkinson; Ferguson, Pailin; G.E.C.; Met.-Vick. Elecl. Co.; A. Reyrolle & Co.; Switchgear & Cowans. Low-voltage fuse gear.—Dorman & Smith; W. Lucy & Co.

Carlisle.—Electricity Committee. Accepted. Cable covers.—H. J. Baldwin & Co. Conduits.—J. & R. Howie.

Great Yarmouth.—Electricity Committee. Accepted for twelve months. Cables.—Britannic Elec. Cable & Construction Co.; B.I. Cables. Meters.—Chamberlain & Hookham; Met.-Vick. Elecl. Co.; Aron Electricity Meter. Transformers.—Bruce Peebles & Co.; British Elec. Transformer Co. Cookers.—Jackson Elec. Co.; Hotpoint Elec. Co. Water heaters.—Heatrae; Johnson & Phillips. Kiosks.—W. Lucy & Co. Switchgear.—Crompton Parkinson.

Hove.—Electricity Committee. Recommended. Mains and services for the change-over from DC to AC in the south-eastern part of the supply area (£15,526).—Callender's.

Hull. — Education Committee. Accepted. Electrical cooking apparatus and domestic apparatus at Kingston High School (£187).—Napier & Wheeldon.

Leeds.—Electricity Committee. Accepted. One 30,000-kW turbo-alternator and condensing plant (£161,796).—B.T.H. Co. Sub-station kiosks for two years.—Yorkshire Switchgear & Engineering Co.

Parks Committee. Accepted. Material for overhauling electric launch batteries (£114).—Pritchett & Gold & E.P.S. Co.

Liverpool.—Hospitals Committee. Recommended. Electrical supplies to the Liverpool city hospitals.—Falk, Stadelmann & Co.

Lincoln.—Electricity Department. Accepted for twelve months. Rubber-insulated cables.—Callender's. Underground joint boxes.—Henley's; B.I. Cables. Consumers' cut-outs.—Siemens Electric Lamps & Supplies Co. Water heaters.—Aidas. Ordinary meters.—Aron Electricity Meter. Prepayment and fixed charge meters.—Aron; Chamberlain & Hookham; Venner Time Switches; Ferranti.

London.—L.C.C. — Accepted. Wiring and fittings for electric lighting, &c., in one block of dwellings on the Minto Street site, Tabard Garden estate, Bermondsey (£484).—S. Reed & Sons. Installation of electric lighting, &c., at Shadwell Fire Station, Stepney (£470).—Bower Engineering Works (Electrical and General). One electric goods lift at Furzedown Training College (£579).—Glasgow Engineers, Ltd.

Manchester.—Health Committee. Accepted. X-ray equipment for Withington Hospital.—Watson & Sons.

Housing Committee. Accepted. Electrical installations at eighteen houses at Moss Side.—D. Foote.

Education Committee. Accepted. Electrical work at Harpurhey High School and Johnson Street School.—A. Loudon.

Gas Committee. Accepted. Telephone switchboard at Bradford Road station.—Siemens Bros.

Electricity Committee. Accepted. Two sub-station kiosks.—Long & Crawford. Mercury arc rectifier equipments.—B.T.H.; Hewittic Electric Co. Emergency control panel for Stuart Street power station.—Ferguson, Pailin. Electric cookers for twelve months.—Carron Company; Simplex Electric Co.; Revo Electric Co.; English Electric Co.

Preston.—Town Council. Accepted. Transformers and switchgear.—English Electric Co.

Rugby.—Town Council. Accepted. Replacement of transformers and switchgear at Oliver Street sub-station (£235).—B.T.H. Co.

Sheffield.—Electricity Committee. Accepted. Supply and laying cable from

Ellin Street sub-station to Victoria Street sub-station (£13,026).—W. T. Glover & Co. Feeder reactors (£14,914).—B.T.H. Two 15,000-kVA transformers (£6,500). One each.—C. A. Parsons & Co.; Hackbridge Elec. Construction Co. Cables for twelve months.—W. T. Glover & Co.

Warrington.—Health Committee. Accepted. Electric clocks at hospital extension.—Synchromatic Time Recording Co.

Highways Committee. Accepted. Electric concrete mixer.—Stothert & Pitt.

Museum Committee. Accepted. Electric sign.—Warrington Electric Co.

Water Committee. Accepted. Condenser for Howley pumping station.—B.I. Cables.

West Hartlepool.—Town Council. Accepted. Five single-phase transformers.—Electric Construction Co.

Whitby.—U.D.C. Accepted. Switchgear (£1,804).—Crompton Parkinson & Co.

Wick.—Town Council. Accepted. Electrical work at eighty houses (£872).—Miller & Stables.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberdeen. — Central fire station (£81,000); city architect.

Aspatria (Cumberland).—Houses (57), for North-Eastern Housing Association; S. Mann, architect, 28, Lowther Street, Carlisle.

Ayrshire.—Reconstruction and extension of Grange Public School, Kilmarnock (£21,932), for C.C.; county architect.

Barnes.—Extensions to factory, for Rad-Reps, Ltd., 209, Richmond Road.

Barrow-in-Furness.—Houses (22), near Jesmind Avenue; A. Peet Houses (28), Norland Avenue; E. Elliott. Houses (154) and flats, Greengate estate; Nicholson & Wright, Ltd.

Birkenshaw.—Houses (64), Whitehall Road; F. Powell, contractor, Birkhill, Whitehall Road.

Birmingham.—Office building, Cumberland Street; C. Bryant & Sons, builders, Whitmore Road. Dwellings (745), Kents Moat estate; Sabin & Young, Ltd.

Blackburn.—Extensions to technical college (£126,700), for the E.C.; W. Pickstone, borough engineer.

Blackpool.—Maternity home (£44,000), Whitegate Drive; borough surveyor.

Bolton.—Houses (80), Crompton Fold estate; W. Gornall & Son, Ltd. School, Eastbourne Grove, for the E.C.

Boston.—Factory, North Street, for Fisher Clark & Co., Norfolk Street.

Brierley Hill.—Municipal buildings (£64,840); U.D.C. surveyor.

Brighouse.—Houses (96), Lillands Avenue estate, and 42 houses, Cain Lane estate, for T.C.; borough surveyor.

Bristol.—Factory, for Derham Bros., Ltd.; British Builders, Ltd., Pennywell Road.

Bromsgrove.—Extensions to Hill Top Hospital, for Joint Hospital Board (£40,000); J. & A. Brazier, Ltd., builders, 103, Newhall Street, Birmingham.

Buxton.—Houses (50), Dale Lane; F. Langley, borough surveyor.

Canterbury.—Houses (70), to complete Reed Avenue housing site, for T.C.; city surveyor.

Carlisle.—Houses (106), Petteril estate, and 76, Raffles estate; J. Miller & Sons. Houses (168), Wigton Road; John Laing & Son, Ltd.

Chelmsford.—Extensions to St. John's Hospital (£4,663); H. R. Barber.

Cleckheaton.—Houses (64); F. Powell, Hunsworth Lane.

Colwyn Bay (Denbighshire).—Houses (110), construction of roads and sewers; J. Llewellyn Griffiths, architect, 70, High Street, Rhyl.

Congleton.—Houses (40); J. Llewellyn Griffiths, architect, 70, High Street, Rhyl.

Coventry. — Bank premises, High Street; District Bank of Manchester. Factory, near Holbrook Lane, for S.S. Cars, Ltd., S.S. works, Swallow Road.

Cromer.—Maternity home and clinic, for Cromer and District Hospital; J. S. Egerton, secretary.

Diss.—Offices and shops, Market Hill; Pearl Assurance Co., Ltd.,

Dover.—School, St. Radigund's Road (£16,173), for T.C.; William Dunk, Ltd., builders, Folkestone.

Dudley.—Houses (34), Buffery Road; A. W. Heathcock. Houses (22), Tanfield Road, &c.; Housing, Ltd.

Dukinfield.—School, Globe Lane, for E.C.; N. High, education secretary, Town Hall.

Dumfries.—Indoor swimming pool and gymnasium, the Greensands (£35,000), for T.C.; burgh surveyor.

Dundee.—School for T.C., Craigielea Place; city architect.

Dunfermline.—Houses (400), Rosyth, for T.C.; burgh surveyor.

Durham.—Joint hospital, Dryburn (£275,467), for C.C.; Gordon, Durham, & Co., Ltd., building contractors, Moor Lane, East Boldon. School, Crossgate Moor, for the C.C.; county architect.

Eastbourne.—Ballroom and covered car park (£70,000), Junction Road; T. F. Sayers and G. H. T. Stone, architects, 51, Gildridge Road. School (£50,000), The Crumbles, for the E.C.; borough surveyor.

Eire. — (Baldonnell). — Quarters for Cadet Officers, for Air Force. (Galway). —College, Mervue Salthill; James Stewart, Ltd., Salthill.

Essex.—Agricultural institute, Writtle (£145,000); library, Clacton-on-Sea (£27,000); school, Rise Park estate, Romford (£10,646); School, West Mersea (£9,897); and enlargement of St. Chad's senior school, Tilbury (£14,549); county architect, Chelmsford.

Glasgow. — Houses (80), Boydston Road, for Housing Committee; city surveyor. Extensions, Tollcross, for Macfarlane Lang & Co., Ltd., Victoria Biscuit works; James M. Munro & Son, architects, 307, West George Street.

Gorleston-on-Sea. — Houses (24), Beccles Road; W. G. Wright.

Grantham.—Nurses' home (£15,000), for Grantham Hospital.

Great Yarmouth.—Rebuilding of police station (£22,000); borough engineer.

Greenock.—Houses (112), Bow Farm; Scottish Special Housing Association, Ltd.

Guildford.—School, Onslow village (£28,060), for the E.C.

Hamble.—Extensions to factory, for Folland Aircraft, Ltd.

Hampshire.—School, Redbridge, for the County E.C.

Harrow.—Houses (36), Imperial Drive; C. J. Pilgrim & Sons, 18, Alexandra Grove, North Finchley, N.12.

Hawarden.—Houses (24), Broughton, for R.D.C.; A. K. Wroe, clerk, Council Offices, Hawarden.

Hemsworth.—Houses (150), for the R.D.C.; W. T. Lynman, R.D.C. surveyor.

Hendon.—Extensions to factory, for Nevitt Bookbinding Co., Edgware Road; Howell & Brooks, architects, 4, Queen Victoria Street, S.W.1.

Kearsley.—Houses (76), Prestolee and Hulme estate; U.D.C. surveyor.

Leeds.—Houses and shops, Penda's Way and Barwick Road; E. Holmes. School, Chapel Lane, for the E.C. Additions to the central fire station, St. George Street; surveyor.

Leven (Fifeshire).—Aircraft factory; L. A. Rolland, architect, Leven.

Leyton.—Depot, Lea Bridge (£70,000), for L.N.E.R.; R. J. M. Ingles, chief engineer, King's Cross Station, N.W.1.

Liverpool.—Houses (73), Jefferies Crescent, Huyton; N. Hurstfield. Page Moss estate, Huyton. Printing works, Fazakerley, for Bemrose & Sons, Ltd., Midland Road, Derby; Richard Costain & Sons, Ltd., contractors, Barlows Lane, Fazakerley.

London.—(Bethnal Green).—Houses, Digby Street, for T.C.; borough surveyor. (Woolwich).—Reconstruction of Hippodrome Picture House, Wellington Street, for Associated British Cinemas, Ltd.; W. G. Glen, architect, 30, Golden Square, W.1.

Longbenton.—Houses (100), Wideopen; U.D.C. surveyor.

Macclesfield.—Extensions (£15,575), St. Albans R.C. schools; A. E. Bradburn, architect, The Ridge, Blakelow.

Maidstone.—A.R.P. control centre; T. F. Bunting, borough surveyor.

Matlock.—Houses (58), Cromford, Goldhill and Bonsall; J. Turner, U.D.C. surveyor.

Morpeth.—Offices, Dacre Street, for the R.D.C. (£9,500); R.D.C. surveyor.

Motherwell.—Offices, Crosshill Street (£15,000), for Colvilles, Ltd.; manager, Colvilles, Ltd., 195, West George Street, Glasgow.

Newcastle-on-Tyne.—Factory, Heaton Terrace, for Austin Lifts, Ltd., Dunn Street. Extensions to King's College (£90,000); W. B. Edwards, architect, 52, Eldon Place.

Northampton.—Factory, Kingsthorpe Hall, for Painton & Co., 32, Newland.

Norwich.—Covered ice rink, The Nest, Rosary Road; J. A. Alpe, Botolph Street.

Nottingham.—Offices, Mansfield Road, Daybrook (£70,000), for Home Brewery Co., Ltd.; Houfton & Son, Ltd., builders, Regent Street, Beeston, Nottinghamshire.

Oldham.—School, for C.E.; F. Thorpe, architect, Union Bank Chambers, Church Street.

Oldswinford.—Rebuilding St. Mary's Parish Church (£13,000), for Rev. H. H. Williams; Sir G. Gilbert Scott, architect, 3, Field Court, Gray's Inn, London, W.C.1.

Patcham.—Cinema, Old London Road, for Barclay's Incorporated, Ltd.; F. E. Bromige, architect, Kingley Street, Regent Street, London, W.1.

Perth.—Houses (50), Glasgow Road, D. Beat & Son, builders.

Portsmouth.—Fire station and telephone exchange, Airport; Airspeed, Ltd.

Romford.—Convalescent home, Pyrgo Park (£104,216); V. G. Selwood & Co.

Ruddington (Nottingham).—Cinema; E. S. Roberts, Lombard House, Great Charles Street, Birmingham.

Seaham Harbour.—Municipal buildings (£18,838), for U.D.C.; Percy L. Browne & Son, architects, Northumberland Street, Newcastle-on-Tyne.

Seaton Valley (Northumberland).—Houses, Foreman's Row, Seaton Delaval; U.D.C. surveyor, Shiremoor.

Shirley (Warwickshire).—Parade of shops, High Street, for Montague Holmes & Son, St. Pauls Churchyard, London, E.C.4; Godson & Son, Ltd., builders, Kilburn, London, W.10.

Southall.—Factory, Lady Margaret Road; Lansdowne Property Co., Ltd., 17, Lansdowne Road, London, S.W.8.

Southport.—Block of flats (five storey), Leicester Street, and Albert Road; H. W. Weedon, architect, 84, Colmore Road, Birmingham.

South Shields.—Technical school for the E.C.; J. H. Morton & Son, architects, Fowler Street. Alterations to girls' high school, for E.C. (£5,000); education superintendent.

Stretford.—Houses (150), Barton estate; borough engineer.

Sunderland.—Alterations and improvements to the Hendon Grange Hotel, for R. Deuchar, Ltd.; Page and Bradbury, architects, 75, King Street, South Shields. Extensions to County Laundry; D. and J. Ranken, contractors, Alexandra Road.

Sutton.—Houses (22), Orchard site; E. D. Mills, architect, Chandos House, Palmer Street, London, S.W.1.

Todmorden.—Houses (102), Carr House estate and Castle estate, for T.C.; Jackson Stansfield & Sons, builders, Stansfield Road.

Uckfield.—Shops and flats, High Street; Knight & Co., Cuckfield.

Warwick.—Houses (74), Cubbington estate; R.D.C. surveyor.

Watford.—Extensions to factory, 161-163, High Street, for P. J. Wilson; Dawe & Carter, architects, 83, High Street.

Weardale (Co. Durham).—Offices for the R.D.C. (£2,200); J. R. Ridley, R.D.C. surveyor, Council Offices, Stanhope.

Welwyn Garden City.—Large extensions to factory, Broadwater Road, for Roche Products, Ltd.; Holloway Bros. (London), Ltd., builders, Bridge Wharf, S.W.1.

West Hartlepool.—Fire Station, Easington Road, for T.C. (£25,000); borough engineer.

Winchester.—Houses (52), Hamble; Solent Land Investments and Follands, Ltd.

Wishaw.—Cinema, Kirk Road, for Green, Ltd.; J. Fairweather & Son, architects, Trongate, Glasgow.

Worcester.—Rebuilding, Silver Cinema, Old Farrier Street, for Odeon Cinema Holdings, Ltd.; H. W. Weedon, architect, 84, Colmore Row, Birmingham.

Workington.—Houses (76), Westfield Farm; borough engineer.

Yorkshire.—School, Bingley (£60,196), for the West Riding E.C., Wakefield.